INST.No. INE-836

CHINO

Graphic Recorder
KR3000
with measured data protection
General Instruction Manual

INSTRUCTIONS

CHINO

—Table of Contents—

PREFACE

Thank you for purchasing the KR3000 series graphic recorder.
Before using your new recorder, please be sure to read this instruction manual that will advise you on how to use the instrument correctly and safely and how to prevent problems.

1. Separate instruction manuals

This instruction manual describes the standard operations and optional alarm output. For other options you specified, their instruction manuals are attached respectively. Read these instruction manuals together with this manual.

2. Request

- Request to instrumentation engineers, constructors, and sale agents
  Make sure to deliver this instruction manual to the operator of this instrument.
- Request to the operator of this instrument
  This instruction manual is necessary for maintenance, too. Keep this manual with care until the instrument is discarded.

3. Attention while unpacking

- Do not drop the recorder while taking it out of the box
- When transporting this recorder, pack the instrument in the original box and then put it with cushions in another box. We recommend keeping the original box for transport.
- When not using the recorder for a while after taking it from the panel, put the recorder in the original box and store at room temperature and in a dust free atmosphere.

4. Important notes for users

- No part of this manual can be reproduced or copied in any form without permission.
- The contents of this manual may be altered without prior notice.
- This manual has been documented by making assurance doubly sure.
  However, if any question arises or if any error, an omission, or other deficiencies are found, please contact your nearest CHINO's sales office.
- CHINO is not responsible for any operation results of this software.

5. Trademarks

- All company names and product names in this manual are trademarks or registered trademarks of their respective companies.
  Please note that the marks "TM" and "®" are omitted throughout this manual.

6. Disposal

6.1 Disposal

Separate the box, plastic bags, and cushioning materials the recorder is packaged in according to the garbage collection method of the each community, and please cooperate to recycle.

⚠Caution

1. A small amount of hazardous substance below the specified level with RoHS directive is included in this recorder.
2. When disposing the recorder always request a professional to do it or dispose it in accordance with local regulations.
3. This recorder includes a lithium battery. When disposing the lithium battery, first remove the battery and always request a professional to do it.

⚠ Warning

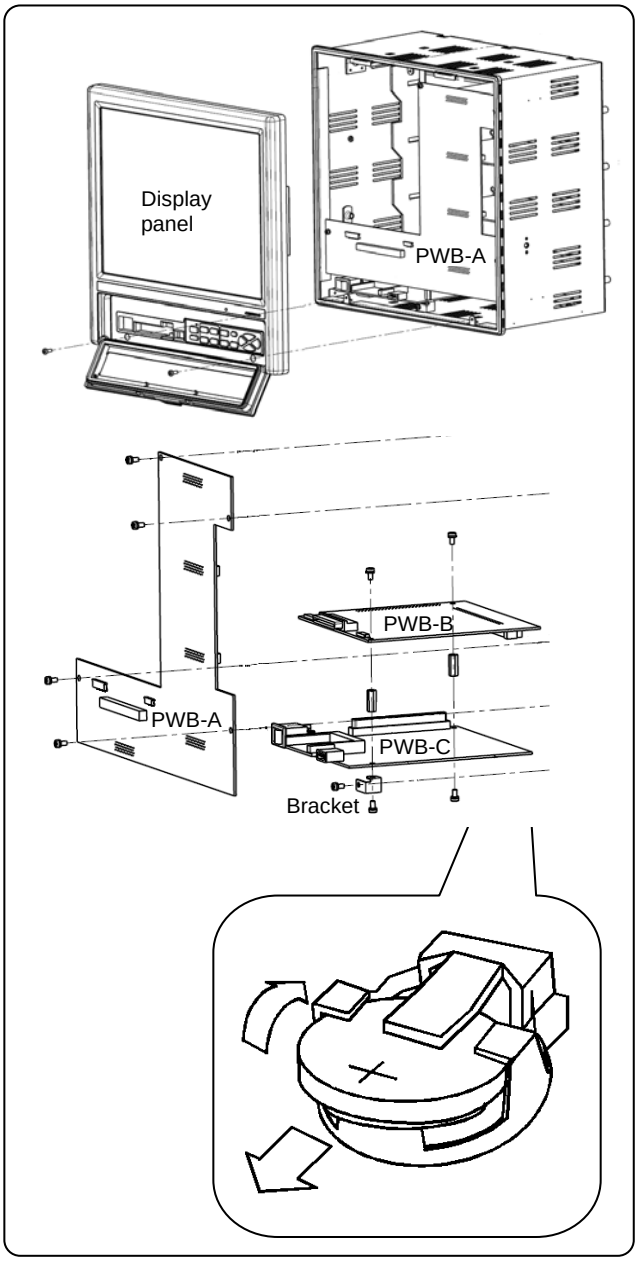
Perchlorate Material

This instrument uses battery with Perchlorate Material.
Special handling may apply, see
http://www.dtsc.ca.gov/hazardouswaste/perchlorate

6.2 Battery removal method

Do not replace the battery. Doing so might cause damage or malfunction. Do not remove the battery, except when disposing the recorder.

(1) Open the key cover and peel off the seal put to the left side of the USB port. Then remove two screws that fix the front display.
(2) Pull the bottom of the front display panel toward you and lift up to remove the front display.
(3) The front display is connected to PWB-A by 1 type of cable. Disconnect it.
(4) PWB-A is connected by 3 types of cables. Disconnect them.
(5) Remove the 4 screws holding PWB-A, and pull it out.
(6) Remove the screw of the mounting bracket under PWB-C.
(7) Disconnect the connector for the power switch cable on the left side of PWB-C and pull out both PWB-B and –C as a set.
(8) Remove the 2 screws holding PWB-B and –C together, and separate PWB-B from PWB-C.
(9) The battery holder is attached to the underside of PWB-B. Lift the front of the battery with a tool having a nonconductive tip and pull the battery out of the holder.



1 For safe use

This section “For safe use” has been compiled to promote the correct use of the instrument in order to prevent human injury or damage to property before they occur. Please read the following information carefully and be sure to observe the warnings and cautions in it.

1. Preconditions for use

This instrument is a component type general product to be mounted on an indoor instrumentation panel. Do not use this instrument in different situations.
Before using this instrument, ensure the system safety by taking appropriate measures such as fail-safe designing and periodic maintenance for the equipment to which this instrument is installed. Connection, adjustment or operation of this instrument should be performed by a professional engineer with knowledge of instrumentation.
Also, a person who handles this instrument should read this instruction manual to fully understand the cautions and basic operations.

2. Labels on this instrument

The following labels are used for safe use.

Label	Name	Meaning
	Alert symbol mark	Indicates the location which should refer to the manual in order to prevent an electric shock and injury.
	Protective conductor terminal	A terminal is provided for connection to the protective conductor of the power supply facility for the prevention of an electric shock.

3. Symbols in this manual

The cautions to be observed for preventing the damage of this instrument and unexpected accidents are sorted by the following symbols according to their importance degrees for enabling operators to use this instrument safely.

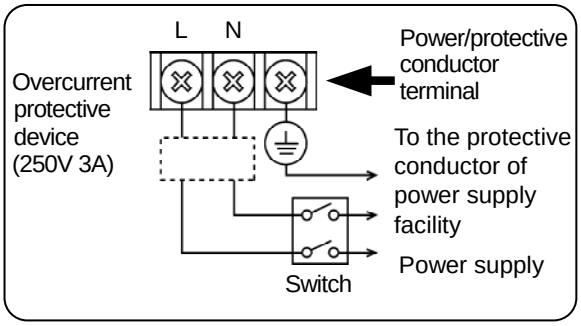
Warning	The nonobservance of information under this symbol may result in hazardous, critical or serious injury to the user.
Caution	The nonobservance of information under this symbol may result in a hazardous situation or a light injury to the user or in physical damage to the property.
Remarks	This symbol shows a caution when the instrument dose not function as specified or when such a possibility exists.
Reference	This reference servers as a supplement for handling and operation, and it may be convenient for the user.

⚠ Warning

This paragraph covers important warning for safety to be observed before reading the instructions. Fully understand the following warning before reading this manual. These warnings are important for preventing the damage to human bodies as well as accidents.

1. Switch and overcurrent protective device

This recorder is not provided with a replaceable overcurrent protective device. Prepare a switch and an overcurrent protective device for the power supply (circuit breakers, circuit protectors or the like) within 3m of this recorder in a location where the operator can access easily Use a switch and an overcurrent protective device conforming to IEC947-1 and IEC947-3.



2. Be sure to ground this instrument

Before turning the power on, connect the protective conductor terminal of this recorder to the protective conductor of the power supply facility. In order to prevent an accident by electric shock, do not disconnect this connection during operations.

Reference Fuse in the power supply

The following fuse is mounted in the power supply unit of this recorder for safety use. However, this fuse is not replaceable.

Maker: Daito Communication Apparatus Co., Ltd

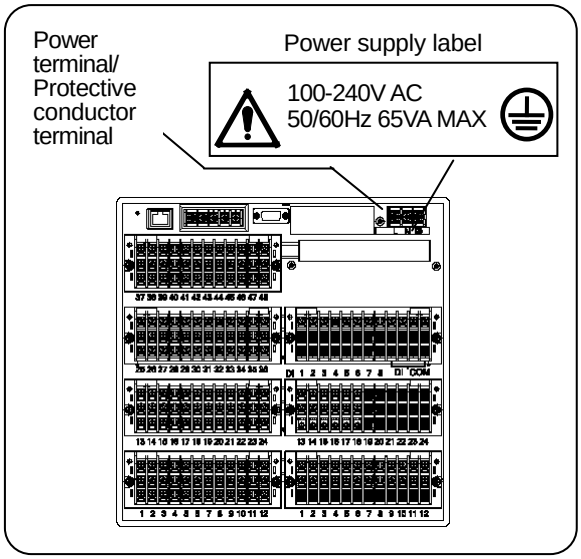
Model: SBL32

3. Before turning on the power supply

In order to ensure safety, before turning on the external power switch, make sure that the power voltage is within the range indicated on the power supply label.

4. Don't repair or modify this instrument

Make sure that any persons other than service engineers approved by CHINO CORPORATION do not repair or modify this instrument by replacing parts. Otherwise it may be damaged or will not function normally or an accident such as electric shock may occur. For ordinary operation, it is not necessary to pull out the internal unit.



5.Use this recorder following this instruction manual

Use this recorder correctly and safely by following this instruction manual. CHINO CORPORATION will not be responsible for any injury, damage, lost profit or any other claim, which may result from its wrong use.

6. Turn off the power supply if an abnormal symptom occurs

Turn off the power supply immediately and contact your local CHINO's sales agent if any abnormal odor, noise or any smoke occurs, or if this recorder becomes high temperature that is too hot to be touched.

2 Before use

Check the following items before using the recorder. If something is wrong, contact your local CHINO's sales agent.

2.1 Exterior check

Check that the instrument is not broken on the outer side.

2.2 Model check

The model number and serial number of this recorder can be confirmed by the label on the upper side of the case.
Check the model of your instrument from the model code before use.

■ Model code

KR3P□ - □□ A

Model (Check with model code.) — KR3P✳✳-✳✳✳
Serial No. — K3✳✳✳✳✳✳✳
MADE IN JAPAN

Measurement point/Sampling rate
- 20: Universal input 12 points (100ms)
- 40: Universal input 24 points (100ms)
- 60: Universal input 36 points (100ms)
- 80: Universal input 48 points (100ms)
- 21: Universal input 12 points (1s)
- 41: Universal input 24 points (1s)
- 61: Universal input 36 points (1s)
- 81: Universal input 48 points (1s)

Communication interface (option)
- N: None
- R: High order communication (RS-232C)
- S: High order / Low order communication (RS-422A/RS-485)

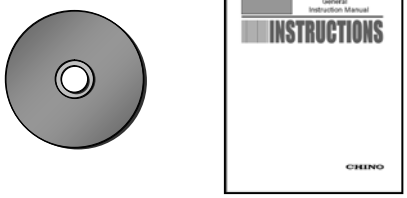
Alarm output, Contact iutput (option)
- 0: None
- 1: Mechanical relay output (12 points ‘a’ contact)
- 2: Mechanical relay output (6 points ‘c’ contact)
- 3: Mechanical relay output (24 points ‘a’ contact)
- 4: Mechanical relay output (12 points ‘c’ contact)
- 5: Mechanical relay output (12 points ‘a’ contact) + Mechanical relay output (6 points ‘c’ contact)
- A: No-voltage contact input (8 points)
- B: Mechanical relay output (12 points ‘a’ contact) + No-voltage contact input (8 points)
- C: Mechanical relay output (6 points ‘c’ contact) + No-voltage contact input (8 points)
- D: Mechanical relay output (24 points ‘a’ contact) + No-voltage contact input (8 points)
- E: Mechanical relay output (12 points ‘c’ contact) + No-voltage contact input (8 points)
- F: Mechanical relay output (12 points ‘a’ contact) + Mechanical relay output (6 points ‘c’ contact) + No-voltage contact input (8 points)

2.3 Checking attachments

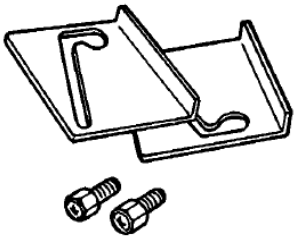
Package contains the following attachments. Please confirm.

Parts name	Quantity	Remarks
① Instruction manual	1 (1 copy)	INE-836□(General), ZAILA-P (analysis software), CD-ROM INE-837□(Mounting/connections edition), A4 Booklet
② Mounting bracket	1	For panel mounting
③ Wrench	1	
④ Terminal screw	5	For input and alarm (digital input) terminals (M3.5) (Spares for missing)

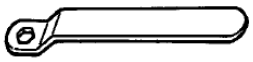
① Instruction manual



② Mounting bracket



③ Wrench

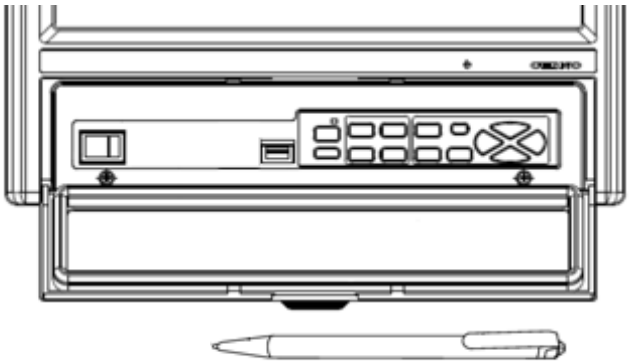


④ Terminal screws

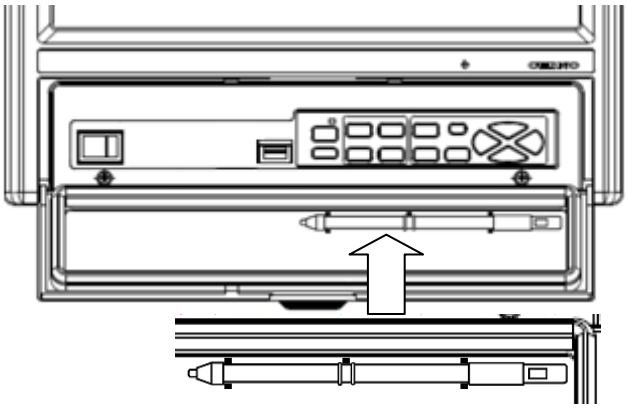
Remarks The method attached of a touch

The method attached of a touch pen to the KR3000 has two types contained with attachments box or included in a KR3000 key cover.

The difference of the key cover with the touch pen



①Type contained with attachments box



②Type included in a KR3000 key cover

3 Installation

⚠Warning

■ Make sure to read and understand this instruction manual to prevent any accident.

3.1 Mounting location

In order to avoid unfavorable effects on the measurement accuracy and recording operation, install this recorder at the following locations.

1) Industrial environment
Select a place away from a source generating an electric field and/or a magnetic field and where mechanical vibrations/shock is not existed.

● Over voltage category・・・・II (EN standard)	● Altitude・・・・・・・2000m or less
● Pollution degree・・・・・・・・2 (EN standard)	● Place of use・・・・Indoor

2) Ambient temperature/humidity
Keep away from direct sunlight and do not close an area around this recorder to avoid temperature increase.
- ●Place with stable ambient temperature of around 23°C and humidity 50%RH
- ●Place not exposed to hot blast (50°C or more) for avoiding deformation of the front panel
- ●Place where there are no wind and no heat source near terminals for avoiding measurement errors.

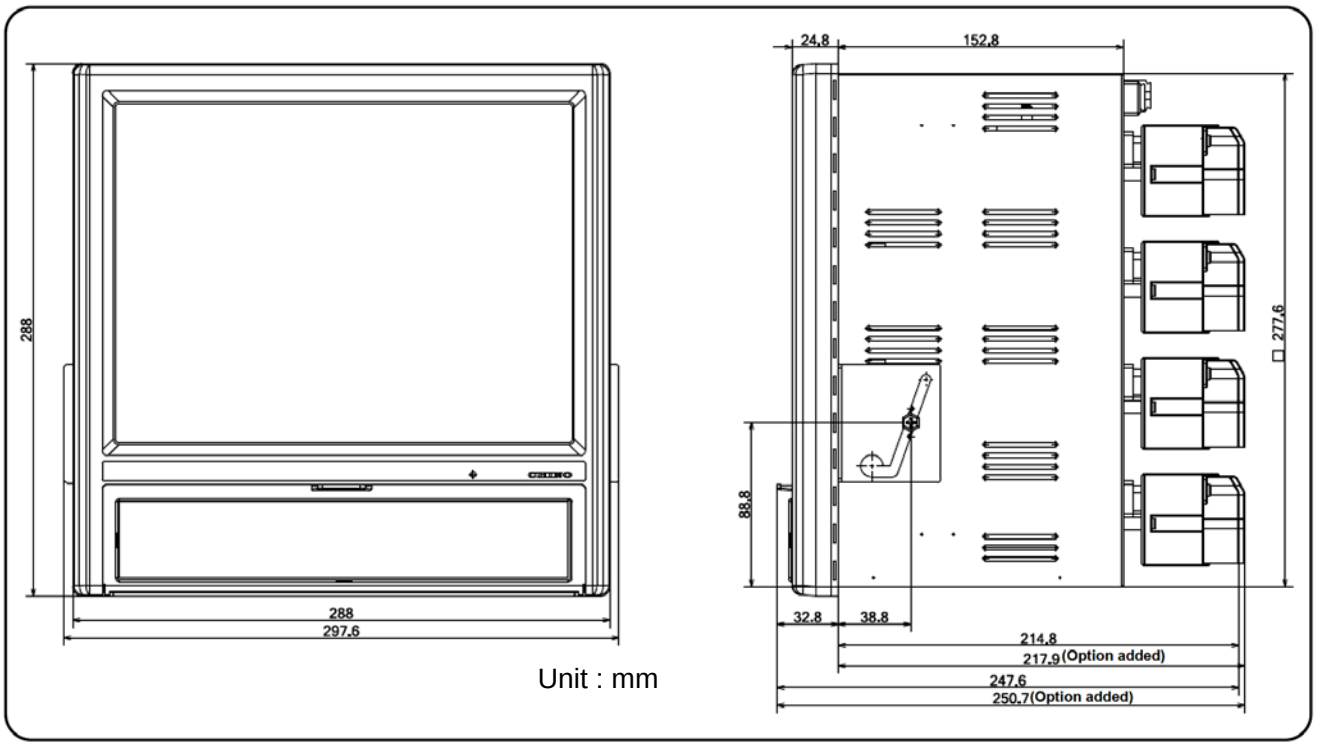
3) Atmosphere
- ●Avoid a place where flammable gases exist.
- ●Avoid a place with dust, smoke, vapors etc.

4) Mounting angle
- ●Lateral tilting・・・0°
- ●Longitudinal tilting・・・Forward tilting: 0°, Backward tilting: 0-20°

Mounting angle other than the above angles will have unfavorable effects on recording operation.

3.2 External dimensions

The following figure shows the dimensions of this recorder with its mounting brackets.



Unit : mm

3.3 Method of mounting the panel

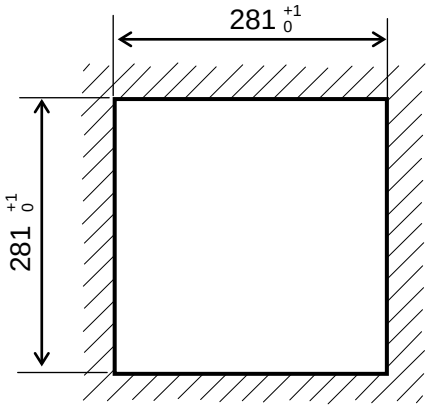
⚠Warning

■ Mount on the panel and use

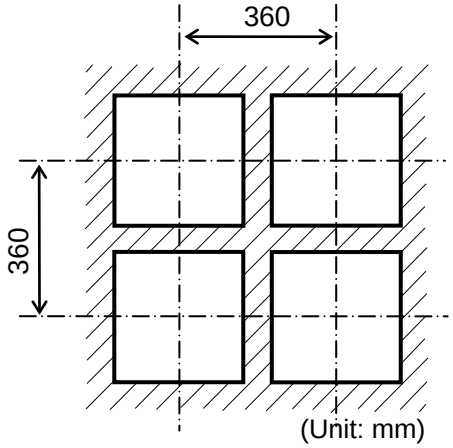
(1) This instrument has been designed to be mounted on an indoor instrumentation panel.

(2) Use a panel made of a steel plate of 2mm to 6mm in thickness or a panel equivalent in strength.

1) Panel cutout size



●Minimum interval for installation of multiple instruments



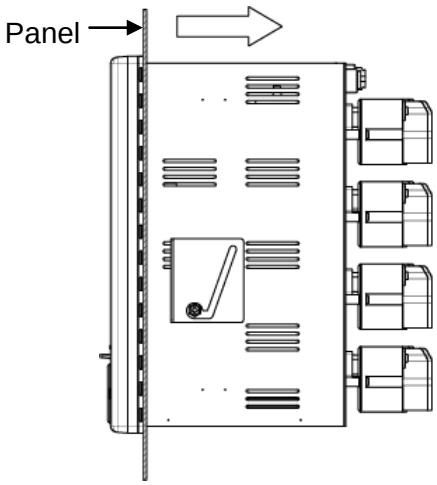
2) Mounting method

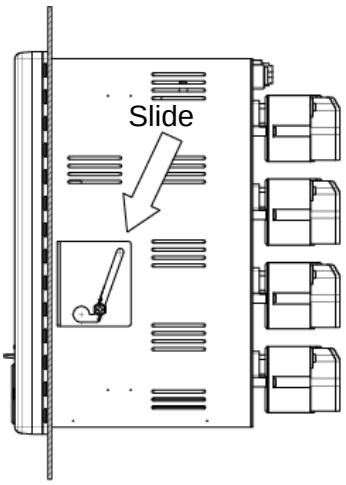
(1) Insert this recorder into the panel cutout part of an instrument panel.

(2) Since there is a screw hole each (a total of two holes) in the right and left sides of this recorder, screw 2 fixing screws attached in two holes lightly.

(3) Next, put the hexagon head of this screw to the circular hole of the mounting bracket and push the recorder to the instrument panel firmly (from front) while making the mounting bracket slide as shown in the figure. On this condition, tighten the fixing screw with the attached wrench or a Phillips screwdriver.
Set the tightening torque on screws to 2.0 N·m (when using Phillips-head screwdriver).

* Note that the mounting brackets used at the right and left sides are different (mounting work should be performed by two persons).

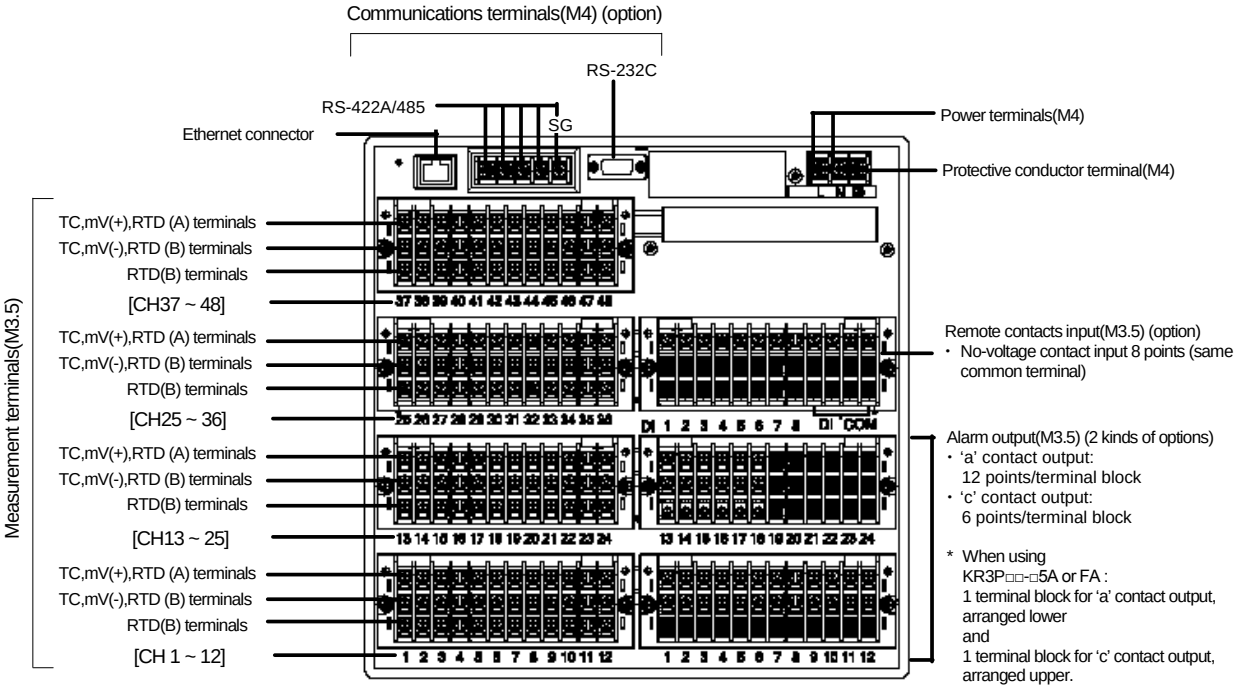




4 Connections

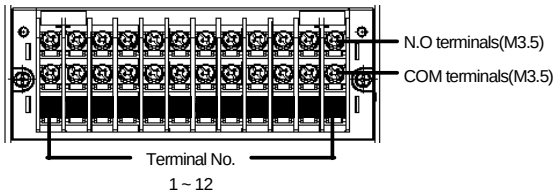
4.1 Terminal board arrangement

The following diagram shows the terminal board arrangement in which option (Alarm relay output [12 points ‘a’ contact], [6 points ‘c’ contact], communication interface) are mounted. Connecter for Ethernet is a standard mounting.

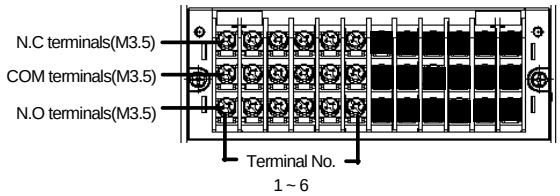


[Option terminal block (* May be changed.)]

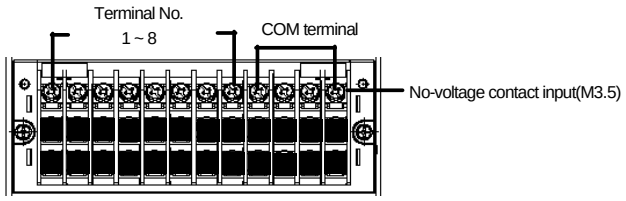
● Alarm relay output (12 points ‘a’ contact)



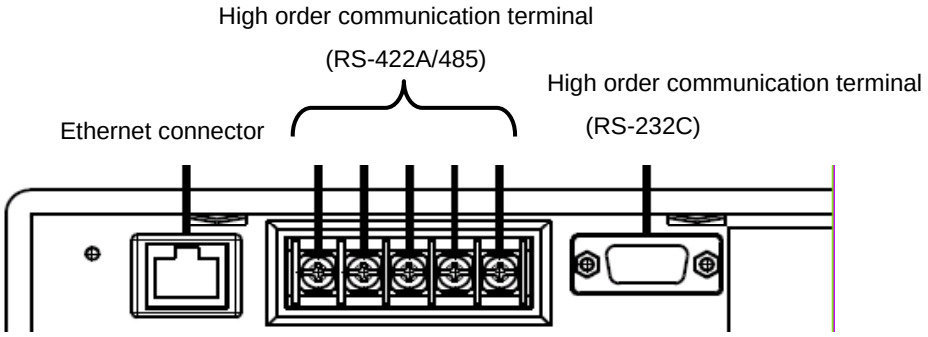
● Alarm relay output (6 points ‘c’ contact)



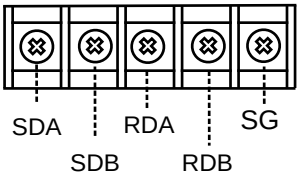
● Digital input (No-voltage contact input, 8 points)



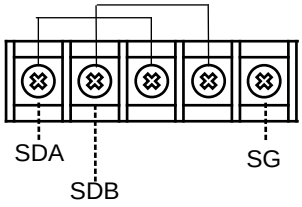
●Communication terminal



● RS-422A terminal arrangement



● RS-485 terminal arrangement



⚠ Warning

■ Alert symbol marks (⚠) and places

The alert symbol mark (⚠) is pasted at danger places where may cause electric shock. (See the following table.)

Name of terminals	Power terminals	Measuring input terminals	Mechanical relay 'c' contact alarm	Mechanical relay 'a' contact alarm
Places marked with the symbol	Lower left of power teminal	Lower right of terminal cover	Lower right of terminal cover	Lower right of terminal cover

Reference Input terminal and alarm terminal blocks are removable

The input terminal block and alarm terminal block (including the contact terminal block) are removable for easy connections.

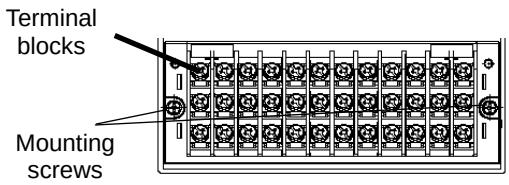
(1) Each terminal block can be removed by removing two mounting screws.

(2) Each terminal block is connected to the recorder by a connector.

⚠ Caution

■Turn off the power supply in advance

For mounting or dismounting the terminal block, turn off the external power switch to prevent the electric circuits from being damaged.



Remarks Replacement of thermocouple input terminal block

Thermocouple input terminal block cannot be replaced by terminal block of other instrument. If replaced measurement error occurs.

4.2 Precautions while connections

Observe the following cautions during connections for securing safety and reliability.

1) Power supply

Use a single-phase power supply having a stable voltage without any waveform distortion for the purpose of preventing wrong operations.

⚠ Warning

(1) A switch and an overcurrent protective device

Prepare a switch and an overcurrent protective device (3A) to the power supply for preventing an electric shock accident during connection work. This recorder is not provided with any replaceable fuse.

(2) Turn off the power supply before connections.

Be sure to turn off the power supply before connecting cables to the power and the input/output terminals to prevent an electric shock.

2) Keep the input/output connections away from a high voltage power circuit

Don't place the input/output cables close or in parallel with any strong power circuits including power line. Place the cables 50 cm or more away from high voltage power circuits when they are placed close or in parallel to other circuits.

3) Keep the thermocouple input away from a heat source

For thermocouple inputs, keep the input terminals away from a heat source (a heating body) to reduce a reference junction compensation error. Don't expose the input terminals to direct sunlight, etc.

4) Keep all connection cables away from noises

Keep all connection cables away from noise source as far as possible, otherwise unexpected malfunction may occur. Provide a solution if the cables cannot be separated from a noise source due to unavoidable circumstances.

Major noise sources	• Electromagnetic switch, etc. • Power line having waveform distortion • Inverter • Thyristor regulator
Counter measures	Insert noise filters between power terminals and input/output terminals. A CR filter is often used.

5) Use crimp style terminals

(1) Fix crimp style terminals to termination of connection cables for preventing the looseness or disconnection of terminals and a short-circuit failure between terminals.

(2) Use the crimp style terminals with insulation sleeve for preventing an electric shock.

6) Unused terminals

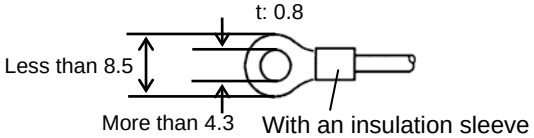
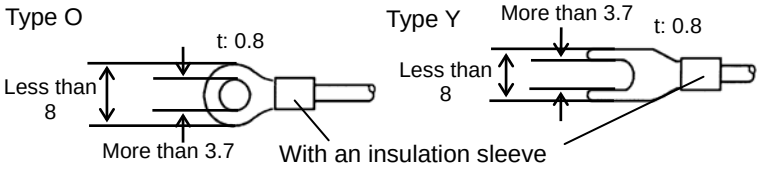
Don't use any unused terminals for relaying; otherwise the electric circuits may be damaged.

⚠ Warning

■ Secure the connected cables properly.

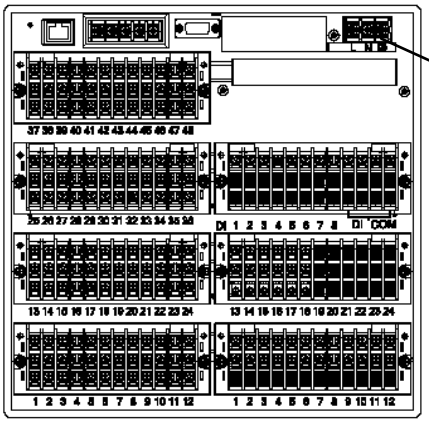
Secure the connected cables so as not to allow them to be hooked by a person or a substance, otherwise the connections may be cut and disrupted that may cause an electric shock or other accidents.

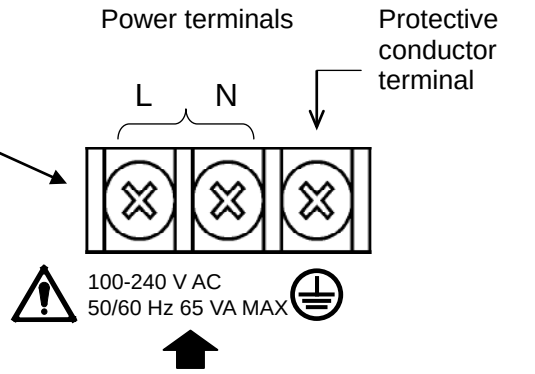
Kinds of terminals and termination

Terminal name	Screw diameter	Tightening torque	Termination (Unit: mm)
Power and protective conductor and communication terminals	M4	1.2N • m	Type O 
Terminals other than described above	M3.5	0.8N • m	Type O Type Y  *Use Type O whenever possible.

4.3 Connection of power and protective conductor terminals

1) Power and protective conductor terminals





⚠ Warning

■ Turn off the power supply.

Be sure to turn off the power supply before connecting cables to the power and protective conductor terminals to prevent an electric shock.

2) Connection of power terminals

For connection to the power terminals, use a 600 V PVC insulated cable terminated by the crimp style terminals with insulation sleeve.

Note) Use the cords approved by the following standards.

(1) IEC 227-3

(2) ANSI/UL817

(3) CSA C22.2 No.21/49

3) Connection of protective conductor terminal

Be sure to connect this terminal to the protective conductor of the power supply facility. For this connection, use a cable terminated by the crimp style terminals with insulation sleeve.

• Grounding wire:

Copper wire 2 mm^2 or more (green/yellow)

⚠ Warning

■ ⚠ mark at power terminals

A voltage of 100 to 240 V AC is applied to the power terminals after connections. Be sure to mount the power terminal cover to prevent an electric shock.

Remarks L/N indication of power terminals

This indication conforms to the CSA standard, Canada. The live side of the single-phase AC power supply is indicated as L, and the neutral side is indicated as N. Observe the L and N connections for obtaining satisfactory performance.

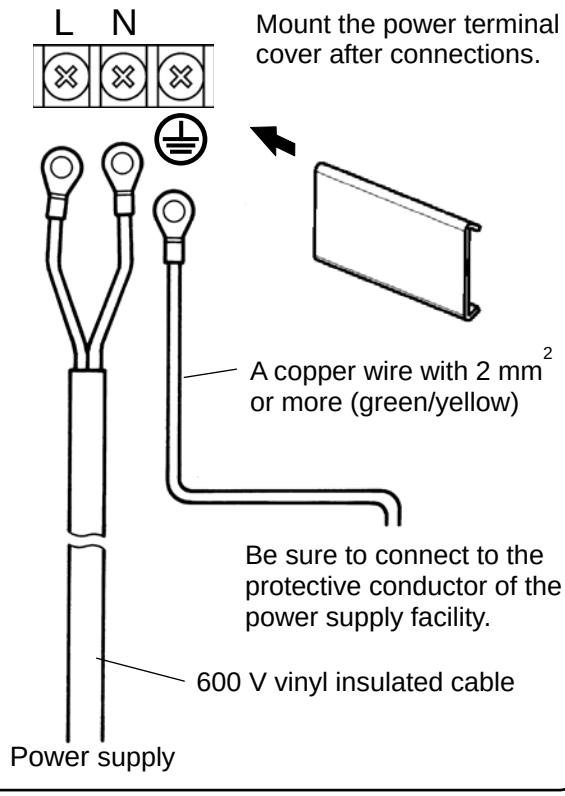
⚠ Caution

■ Be careful with the power voltage and noises.

The power voltage of this instrument is indicated beside the power terminals.

Don't apply any voltage other than indicated; otherwise a malfunction may result.

If noise is generated at the power supply, provide a noise reduction transformer, etc.



4.4 Connection of measuring input terminals

1) Measuring input terminals

Be sure to turn off the power supply to prevent an electric shock.

- For the connections to the input terminals, use cables terminated by the crimp style terminals with insulation sleeve

⚠Caution

■ Allowable input voltage

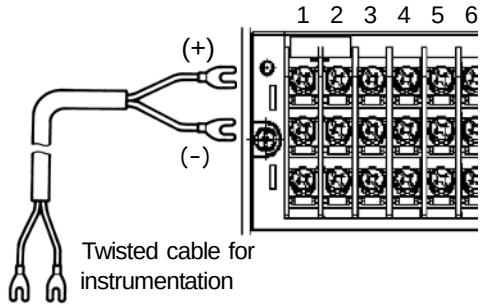
Input type	Allowable input voltage
Voltage, thermocouple input	±10 V DC*
Resistance thermometer input	±6 V DC

* ±60 V DC with channel settings to the ±5 V or higher range.

2) Connections of DC voltage (current) input

Use twisted cables for instrumentation as the input cables for the purpose of suppressing noises. For current inputs, mount shunt resistors to the channels to be measured before connections.

- DC voltage (current) input



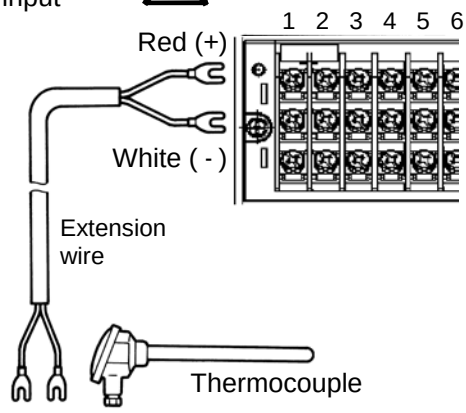
Remarks Isolation of measured input terminal

TC, mV(+), RTD(A) terminal and TC, mV(-), RTD(B) terminal are insulated each channels but RTD(B) terminal is short-circuited between channels. KR3P*0 is short-circuited between channel 1 to 4, 5 to 8, 9 to 12 of each input terminal unit, and KR3P*1 is short-circuit channel 1 to 12 of each unit.

3) Connections of thermocouple (TC) inputs

Be sure to use thermocouple wires (or extension wires) to the input terminals of this recorder. If a copper wire is used halfway, a noticeable measuring error occurs. Don't use a pair of thermocouple wires in parallel with other instruments (controller, etc.), otherwise a malfunction may occur.

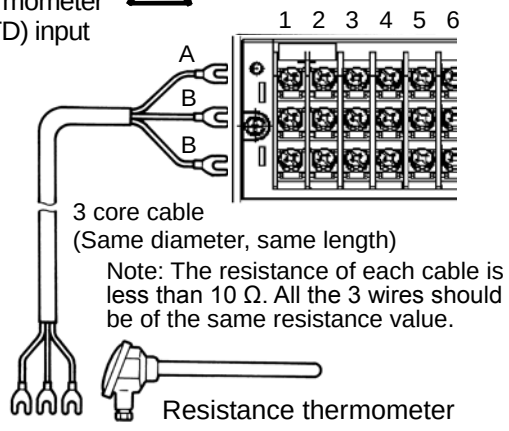
- Thermocouple (TC) input



4) Connections of resistance thermometer (RTD) inputs

Use a 3-core cable where each lead wire has an equal resistance value. Don't use one resistance thermometer in parallel with other instruments (controller, etc.).

- Resistance thermometer (RTD) input



⚠ Warning

■ ⚠ mark of measuring input terminals

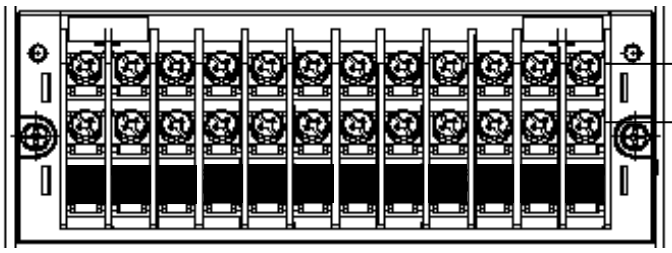
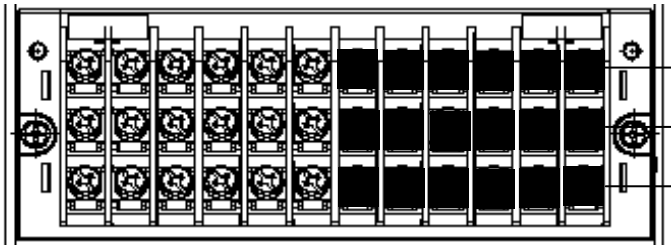
A high voltage may be applied to the measuring input terminals due to common mode noises. The allowable noise value is lower than 30 V AC or lower than 60 V DC. Make sure that the noises are lower than the allowable values. Mount the terminal cover after connections for the purpose of preventing an electric shock and to protect the input wires. In the case of thermocouple input, the mounting of the terminal cover can reduce the reference junction compensation error.

4.5 Connection of alarm output terminals (option)

This is for the recorder with alarm output terminals (option).

1) Alarm output terminals

The terminal arrangement depends upon the type of alarm output.

Alarm relay output (1a)

Alarm relay output (1c)


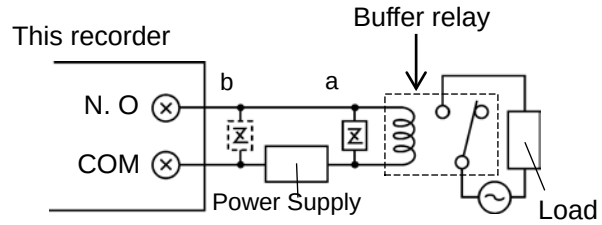
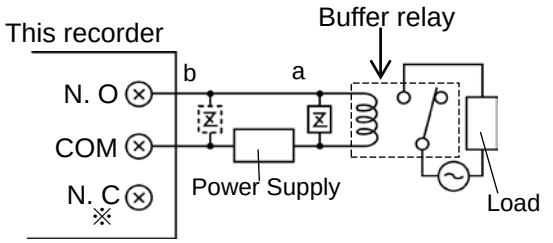
2) Connections

Turn off the power supply and buffer relay power supply before connections to prevent an electric shock.

(1) Connect cables to the load via a buffer relay.

(2) Use cables with the crimp style terminals with insulation sleeves for the alarm output terminals.

(3) If a voltage of more than 30 VAC or 60 VDC is to be applied to the output terminals, use type O crimp style terminals with insulation sleeves. Furthermore, use double-insulated wires (dielectric strength of 2300 VAC or more) for the signal wires on which a voltage of more than 30 VAC or 60 VDC is to be applied. For all other wires, use basic insulated wires (dielectric strength of 1390 VAC). Be sure to mount the terminal cover to prevent an electric shock.

Example of mechanical relay 'a' contact outputs	Example of mechanical relay 'c' contact outputs
 : Contact protective element (It is recommended to mount this element on the a side)	 : Contact protective element (It is recommended to mount this element on the a side) ※N.C terminal - Open relay contact at alarm activation that is the reverse action to N.O terminal.

⚠ Warning

■ ⚠ mark of alarm output terminals

Connect a load not exceeding the specified contact capacity to the alarm output terminals. A buffer relay power supply is applied to the alarm output terminals after connections. Do not touch these terminals since an electric shock will occur. Be sure to mount the terminal cover after connections.

⚠ Caution

■ Take a safety measure.

An alarm output of this recorder may become defective caused by wrong operation, failures, and other abnormal inputs.
Take a safety measure against an output failure before use as occasion calls.

3) Precautions for connection

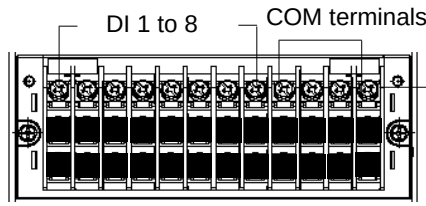
Be careful with the following cautions for connections.

Item	Contents
Contact rating of Mechanical relay outputs (Common to 'a' contact and 'c' contact)	<table><tr><th>Power supply</th><th>Resistive load</th><th>Inductive load</th></tr><tr><td>100 V AC</td><td>0.5 A</td><td>0.2 A</td></tr><tr><td>240 V AC</td><td>0.2 A</td><td>0.1 A</td></tr><tr><td>30 V DC</td><td>0.3 A</td><td>0.1 A</td></tr></table> (Minimum load) 100μA 100mVDC
Mounting of contact protective element Z	● Mount a contact protective element conforming to the buffer relay. The relay is broken, if a signal exceeding the contact rating is applied even if momentarily. ● To prevent a malfunction being caused by a light load, the most effective mounting position for the element is on the coil side of the buffer relay ('a' in the connection diagrams under (2) on 4.5)
Selection of buffer relay	(1) Coil rating ..... Less than the contact rating of output terminals (2) Contact rating ..... More than twice the load current A coil surge absorption element built-in type relay is recommendable. Mount an additional buffer relay if a buffer relay satisfying the load rating is not available.
Selection of contact protective element	Mount a contact protective element if a surge absorption element built-in buffer relay is not available. This element is generally composed of C (capacitor) and R (resistor). <Reference values of C•R> C : 0.01 μF (Rating about 1 kV) R :100 to 150 Ω (Rating about 1 W)

4.6 Connection of digital input terminals and function selection (option)

This is for the recorder with digital input terminals (option)

1) Digital input terminal



Remarks Features of digital input terminal

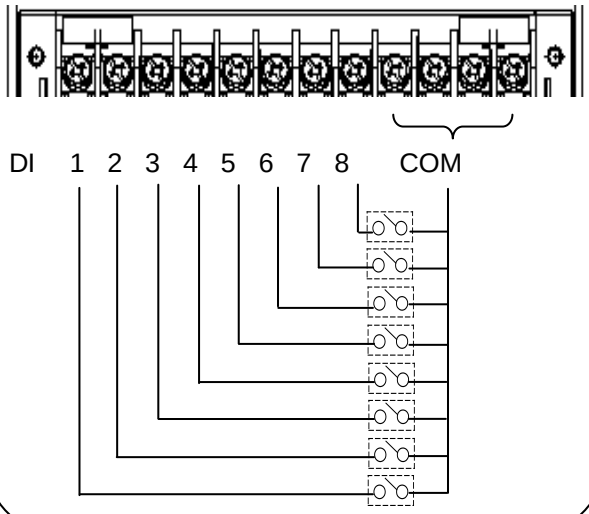
- Voltage when the contact is open.
  : Approx. 5 V
- Current when the contact is short.
  : Approx. 2 mA

2) Connections

Turn off the power supply before connections to prevent an electric shock.

(1) Apply a no-voltage contact signal to digital input terminals.
(2) Use cables terminated by crimp style terminals with insulation sleeves for the digital input terminals.

■ Connection example



⚠Caution

■ No-voltage contacts

For the contacts to be connected to the Digital input terminals, use a switch or relay driven at lower than 30 V AC or lower than 60 V DC, or manual contacts for very light loads.

■Functions of terminals

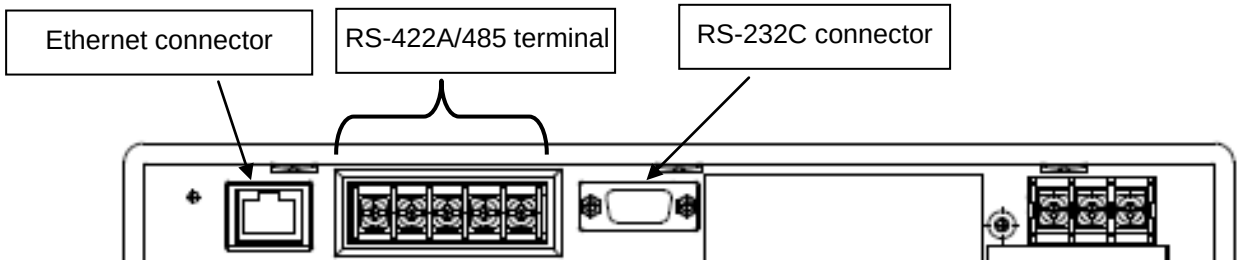
(1) Digital input	ON/OFF (short/open) state can be measured. Select the range type as DI. (Refer to Para.10.3 Input operation settings.)
(2) Pulse input	Used as the pulse input. Select the range type as Pulse (+) and Pulse (-). (Refer to Para.10.3 Input operation settings.)
(3) Totalizer reset	The reset of totalizer is executed. When the digital input terminal specified becomes ON, the totalizer reset is executed. (Refer to Para.10.7 Totalizer reset settings.)
(4) Marker	The writing of marker. The marker can be written on the trends when the digital input terminals become ON. (Refer to Para. 10.9 Marker text settings.)
(5) File drive	The recording start/stop of data file in the internal memory is executed. The recording starts or stops when the digital input terminals become ON or OFF. (Refer to Para. 10.6 File settings.)

● Each function requires a short circuit of 0.1 second or more between the COM terminal and each terminal.

4.7 Connection of communication I/F terminal

The KR3000 can be communicated with a master unit via Ethernet and RS-232C, RS-422A or RS-485, and with a slave unit via RS-422A or RS-485.

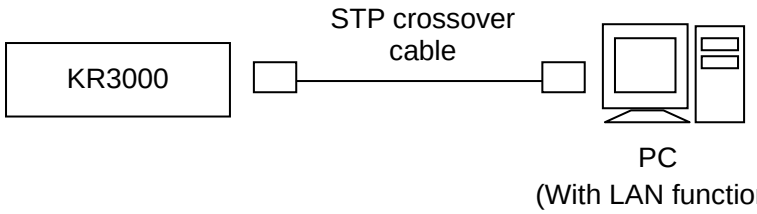
*RS-232C /422A /485 terminal and serial communication function are optional.



1) In case of high order communications via Ethernet

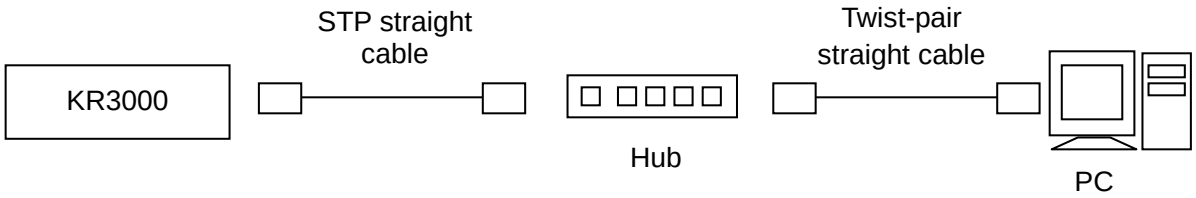
[In case of connection with a PC by 1 to 1]

To connect PC and KR3000 on one-to-one basis, use the STP crossover cable.



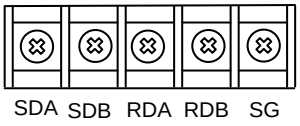
[In case of connections with PCs by N to N]

For the connection to multiple PCs or an existing LAN, use a switching hub and an STP straight cable between the hub and the Ethernet IF.



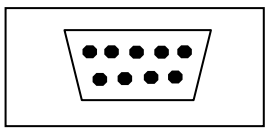
2) Types of communication terminals

● RS-422A/RS-485



High order or low order communication

● RS-232C

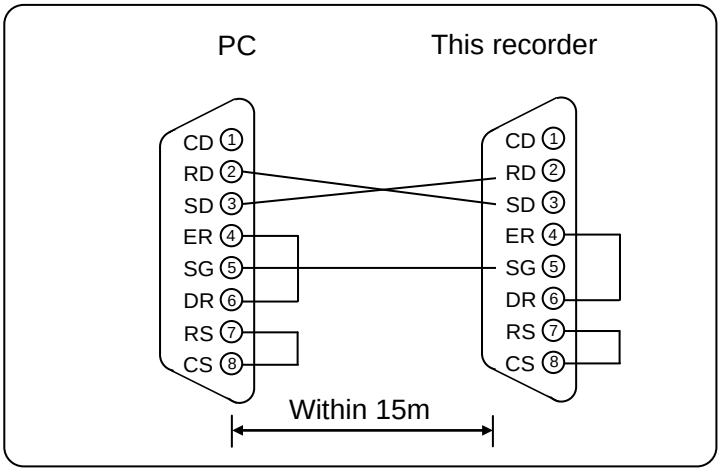


High order communication only

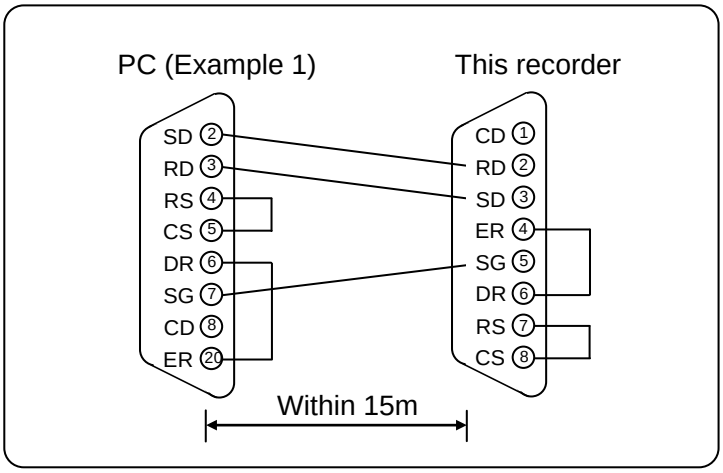
3) Connections of High order communication RS-232C

The communication terminals of this recorder are three terminals of SD, RD and SG and a control signal is not used. General personal computers use the control signal. Wiring processing for control signal in a connector depends upon how the control signal is used in a personal computer. For details, refer to the instruction manual for your personal computer.

(1) Example of 9-pin connector

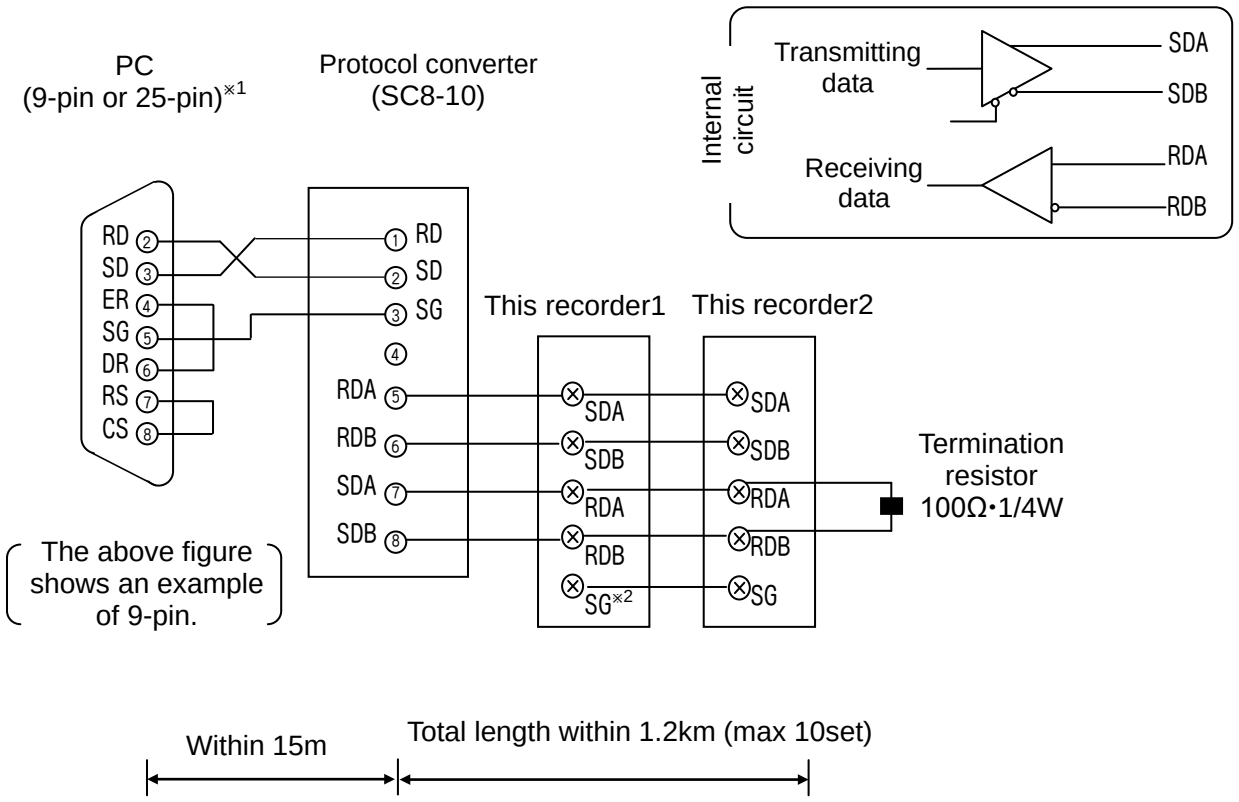


(2) Example of 25-pin connector



4) Connections of High order communication RS-422A

The RS-422A communications interface is connected to a personal computer via a protocol converter (our Model SC8-10: sold separately). Three signals of SD, RD and SG are used between the protocol converter and a personal computer and a control signal is not used.



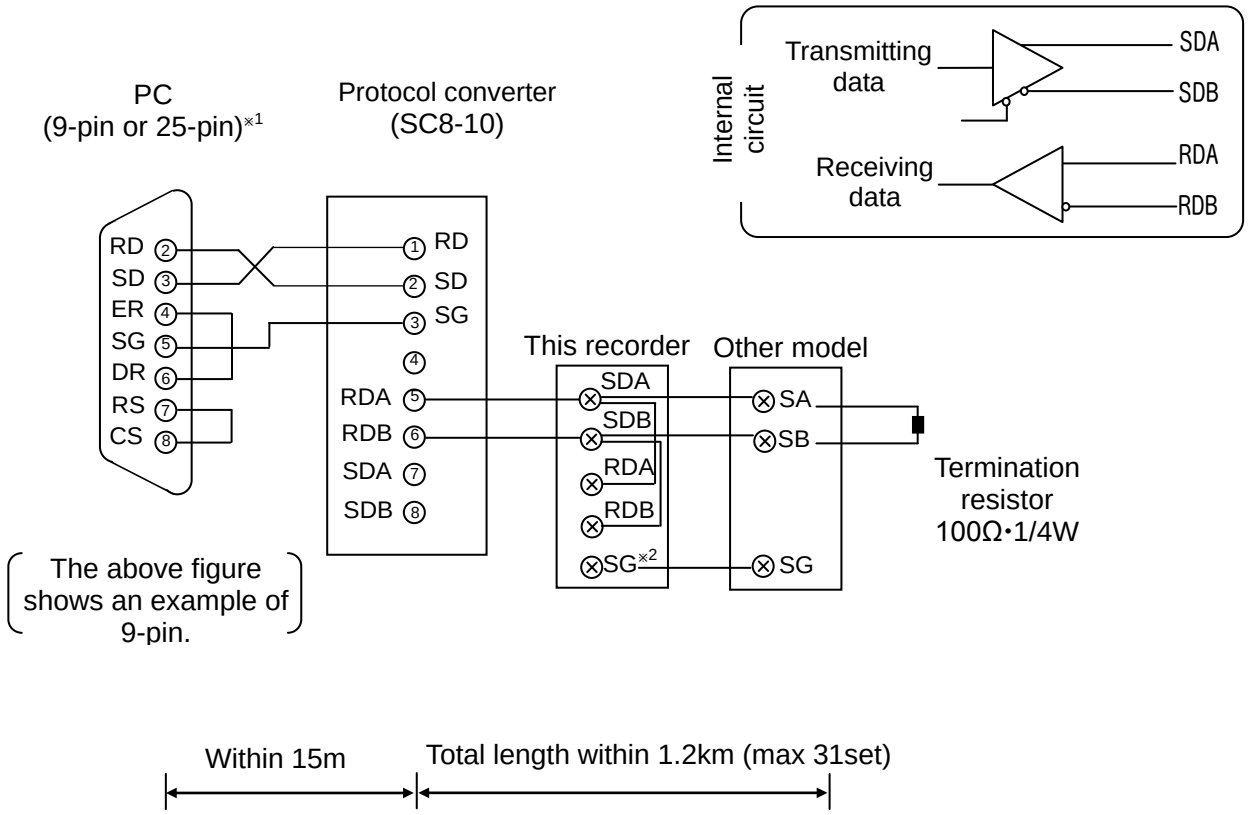
※1 For wiring process of connector, refer to “3) Connection of High order communication RS-232C”.
※2 Do not connect SG wire to the FG terminal or ground terminal of the device.

Remarks Mounting termination resistor

To ensure the transmission of data via RS-422A communications, mount a termination resistor at the ends of receiving lines. When the protocol converter (SC-8) is at an end of a transmission circuit, short the terminals of ④ and ⑤ of the unit to insert the termination resistor automatically.

5) Connections of High order communication RS-485

The RS-485 communications interface is connected to a personal computer via a protocol converter (our Model SC8-10: sold separately). Three signals of SD, RD and SG are used between the protocol converter and a personal computer and a control signal is not used.

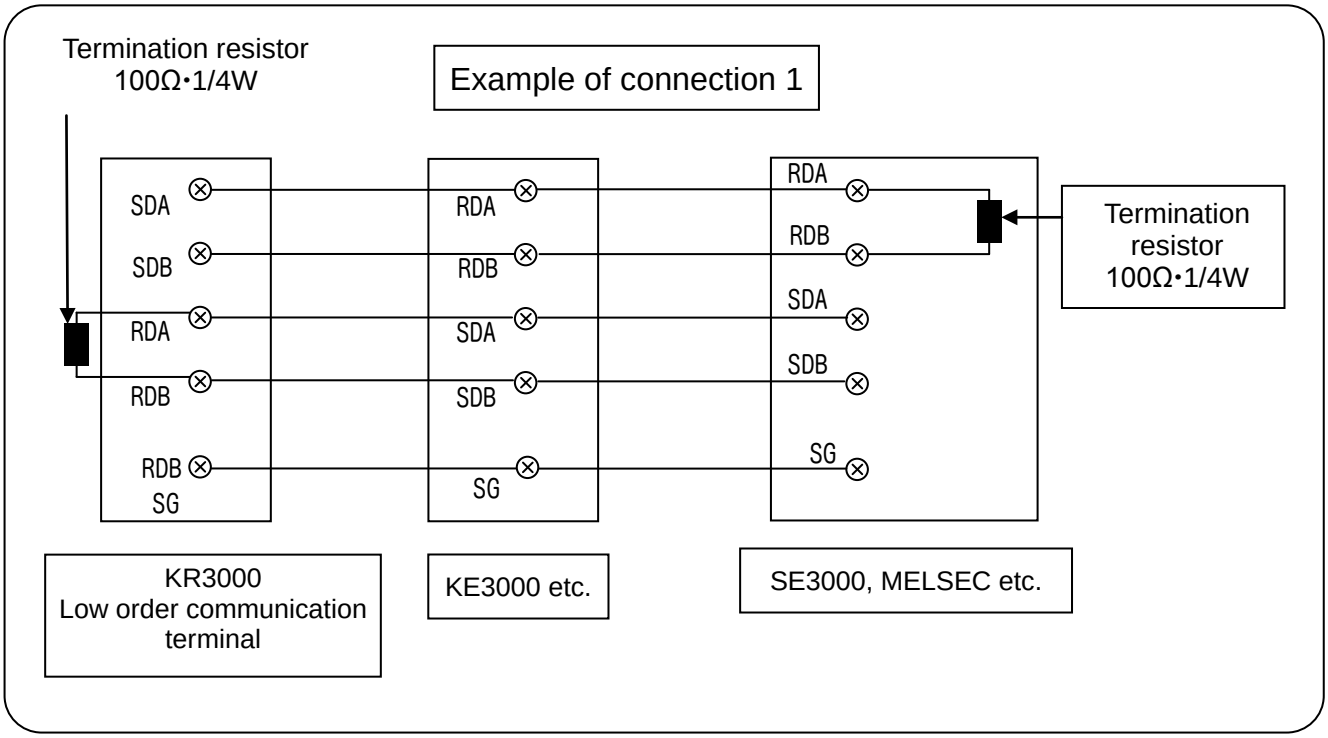


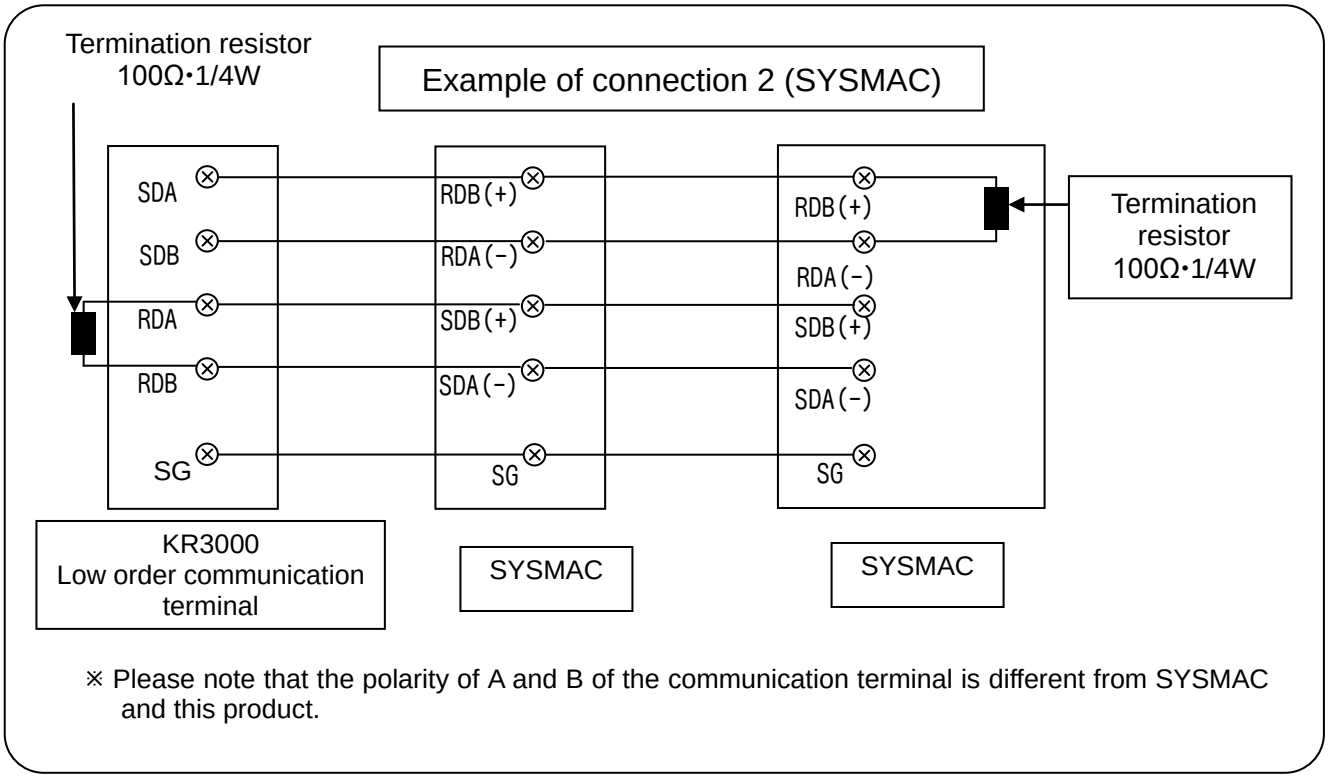
※1 For wiring process of connector, refer to “3) Connection of High order communication RS-232C”.
※2 Do not connect SG wire to the FG terminal or ground terminal of the device.

Remarks Mounting termination resistor

To ensure the transmission of data via RS-485 communications, mount a termination resistor at both ends of transmission lines. When the protocol converter (SC-8) is at an end of a transmission circuit, short the terminals of ④ and ⑤ of the unit to insert the termination resistor automatically.

6) Connections of Low order communication RS-422A



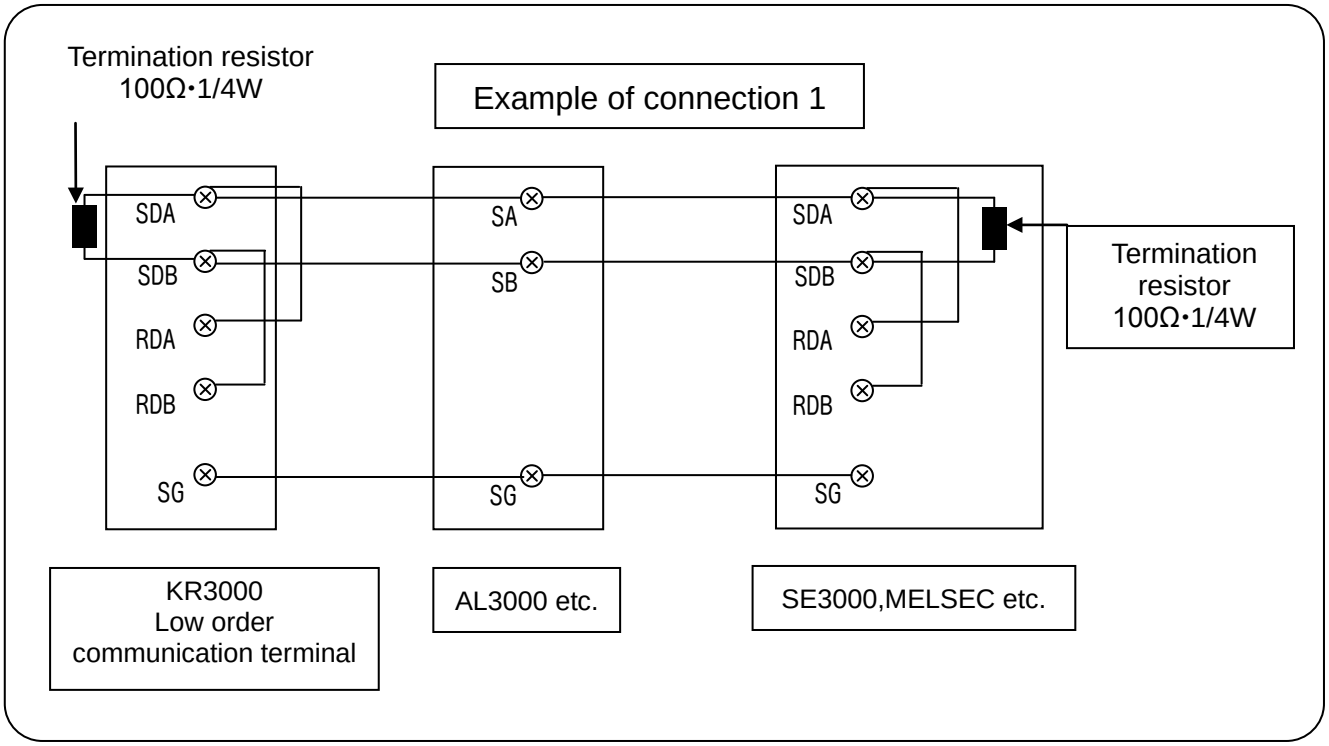


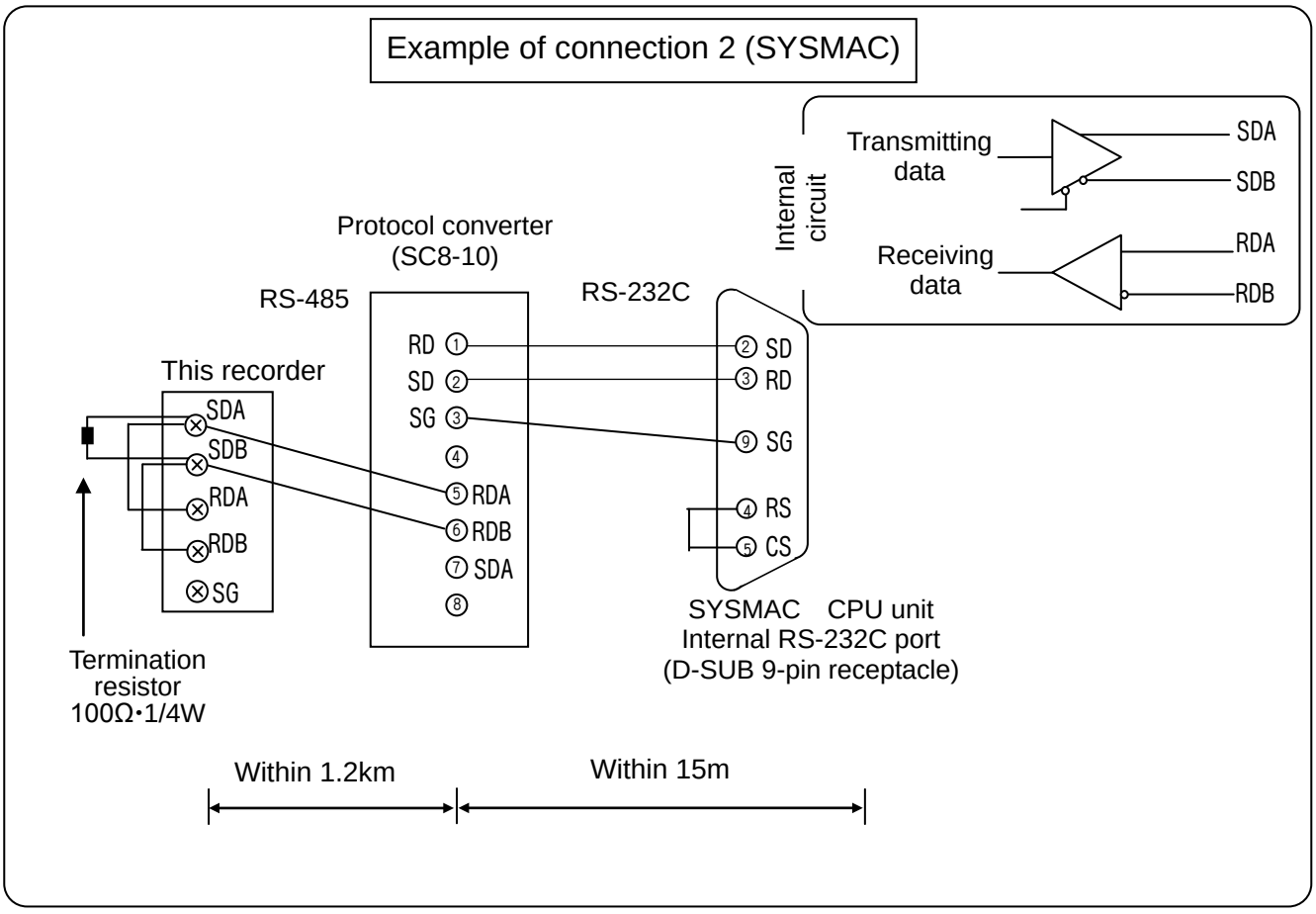
※ Please note that the polarity of A and B of the communication terminal is different from SYSMAC and this product.

Remarks Mounting termination resistor

To ensure the transmission of data via RS-422A communications, mount a termination resistor at the ends of receiving lines.

7) Connections of low order communication RS-485





Remarks Mounting termination resistor

To ensure the transmission of data via RS-485 communications, mount a termination resistor at both ends of transmission lines. When the protocol converter (SC8-10) is at an end of a transmission circuit, short the terminals of ④ and ⑤ of the unit to insert the termination resistor automatically.

5 Main features and functions

This instrument measures temperature and various industrial quantities for multiple channels, and displays the measurement result with various formats including real time trend graph, bar graph, and numeric value on the 12.1-inch TFT color LCD. Also, data stored in the internal memory can be copied and stored in USB memory when needed. You can analyze the copied data using the analysis software (ZAILA-P) specifically designed for our products. Security functions such as login control and audit trail are also provided.

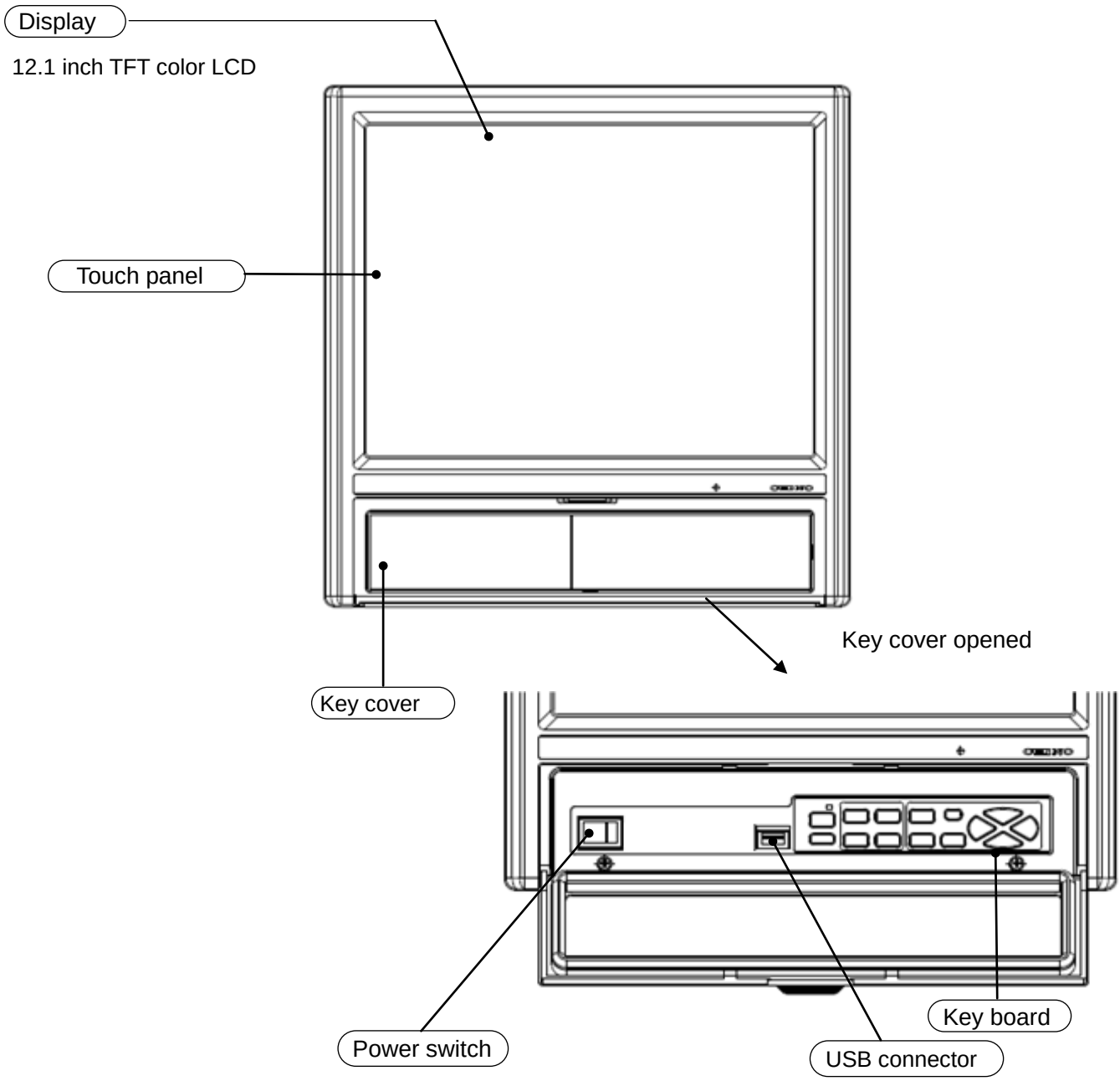
Easy management of measurement result	The monitoring of measurement results is easy since the data are displayed on various formats of screens. Also, recorded data can be copied in USB memory and replayed on a PC using our analysis software (ZAILA-P).
Various screen displays	Various types of screen display are available including real time trend, historical trend, bar graph and numeric value (in a table format). Selecting and combining different types of display is possible, and this enables you to conduct monitoring on the screen optimized for your need. The alarm display screen that shows a list of past alarm activations, marker list screen and audit trail screen are also available.
Recording condition settings	Start/stop of recording data can be set by arbitrary condition settings of key operation, alarm, clock settings, etc.
Memory function	Normally, data is stored in the internal memory. Stored data or setting files can be copied and stored in USB memory.
Analog recorder feeling	As the trend screen displays data on a chart with scale plates and pointers, the data can be monitored like analog recorder.
Security	Various security functions are available, such as login control, audit trail and setting history file. ※Audit trail provides the information of date, content and user name regarding operations and changes made.
Marker function	Marker and marker text can be written on the trend screen being recorded. You can register marker texts in advance for easier operation. ※Marker cannot be written to the data of previous files.
Easy system construction	Optional high/low order communication function enables communication with devices equipped with MODBUS protocol, without creating communication software. (MODBUS: The registered trademark of Schneider Electric SA)
Consumables not required	Since consumables like charts, pens and inks as used in recorders are not required, this recorder is clean and less time consuming.
Easy setup	Operations are executed with the keys or touch panel. To configure settings, an operator selects a set item from the menu and set it on the setting screen. This interactive manner of setting enables easy setup.
Software package is available	Data analysis can be executed easily on the PC as software package for data analysis is available. ● ZAILA-P (analysis software)

Remarks Display of audit

"Audit trail" and "Audit trail information" are abbreviated as "Audit" and "Audit info" respectively on the screen of this instrument.

6 Part names and functions

6.1 Name of the front panel and its major function



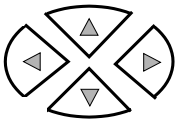
⚠Caution

■ Front glass

- The front of display part is made by glass. To avoid injuries due to broken glass, do not blow the glass hard.
- Do not rub or push the touch panel by a sharp edged tool or a sharp material.
- For dirt on the front glass, wipe it lightly with a soft cloth infiltrated with neutral detergent or alcohol into soft cloth.
- Coordinates cannot read normally if two points are pushed simultaneously. Push one point in operations.

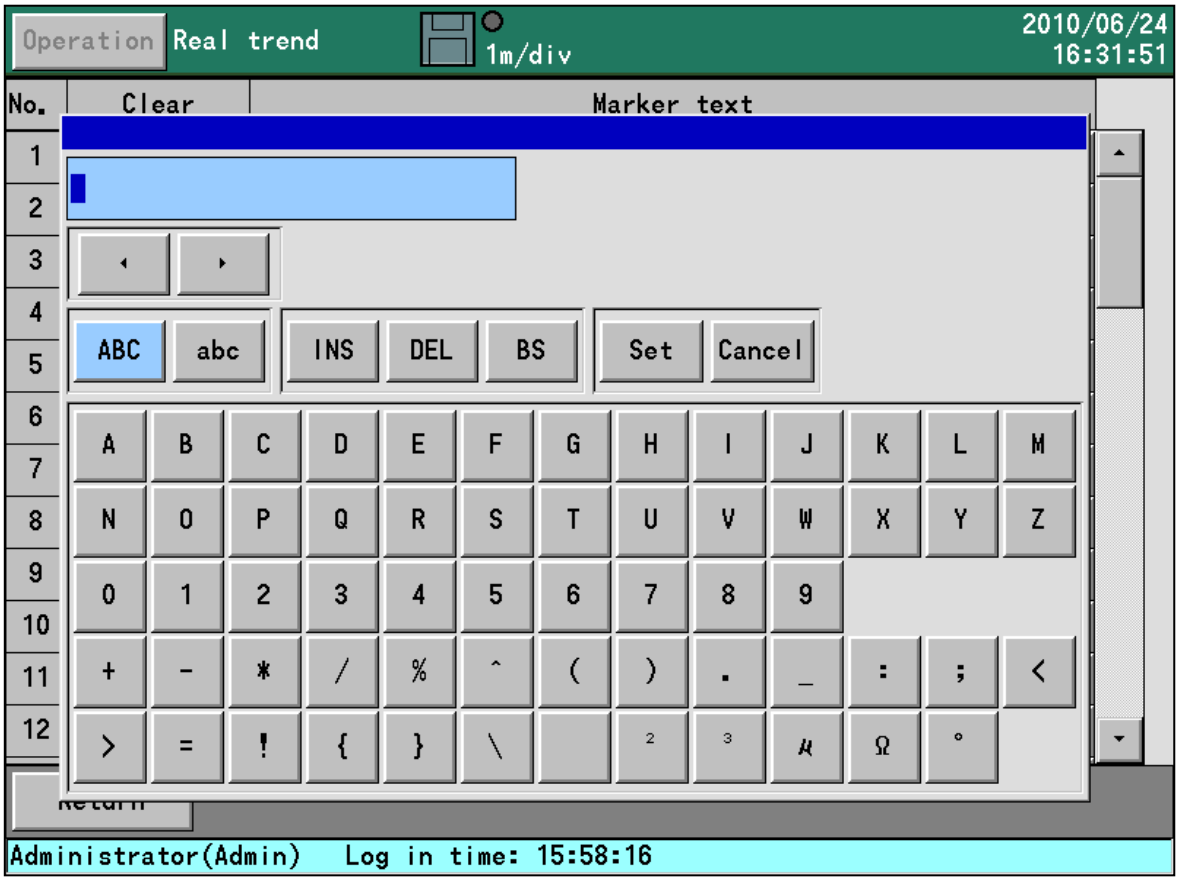
6.2 Names of keys and their functions

- Usage and functions of keys differ depending on the operation screen and the setting screen.
- Operations of all keys can be performed on the touch panel. Therefore, all operations enable with the key cover closed.

Key	Keys and major usage/functions of each screen	
	Operation screen	Setting screen
START	The recording starts.	Not used
STOP	The recording stops.	Not used
SCROLL	Used for switching of the scroll mode and for moving to the historical trend screen.	Not used
CURSOR	Used for switching the cursor mode in the historical trend screen.	Not used
MARKER	Used to write a marker on the trend screen.	Not used
DISP	Used to display the DISP menu.	A snapshot is taken by pressing this key for a long time.
HOME	Used to display the specifications confirmation screen.	Used to exit the specifications confirmation screen.
MENU	Used to display the setting screen.	Used to return to the previous screen.
ESC	Used for cancelling menus or for returning to a previous screen.	Used to return from the setting screen to the operation screen or return to a previous screen.
ENTER	Used to enter a menu item or display the ENTER menu.	Used to open a selected menu or enter a numeric value, a character, etc. selected by the cursor. Also, used to store a parameter when the setting screen returns to the operation screen.
 Direction keys	Used to select a menu item or change a display group and a channel.	Used to move the cursor to the left, right, up and down.

6.3 Character entering method

- This screen is used for setting a tag name, a marker text character string and setting/entering a password.



When the character input screen is displayed, by pressing the “ABC” or the “abc”, keys arranged on the lower column are changed to indications corresponding to the key pressed. Press a character to enter. Then, the character selected is displayed on the character display column. When a character is touched on the character display column, the cursor moves to its position and a character can be inserted (or overwritten) at the cursor position.

ABC	Alphabet capital letters, symbols and numeric can be entered.
abc	Alphabet small letters, symbols and numeric can be entered.
INS	Inserting or overwriting can be selected. (Inserting and overwriting are switched each time this key is pressed.)
DEL	A character selected on the character input column is deleted.
BS	The character being one position before the character selected on the character input column is deleted.
Set	Inputted characters are entered. Inputted characters are also entered by pressing the ENTER key after moving the focus to the character input column.

6.4 Touch panel operation method

- All operations of this recorder can be executed on the touch panel.
- In case of abnormality in the touch panel or same operation as the KR2000 series is required, execute operations with the keyboard.

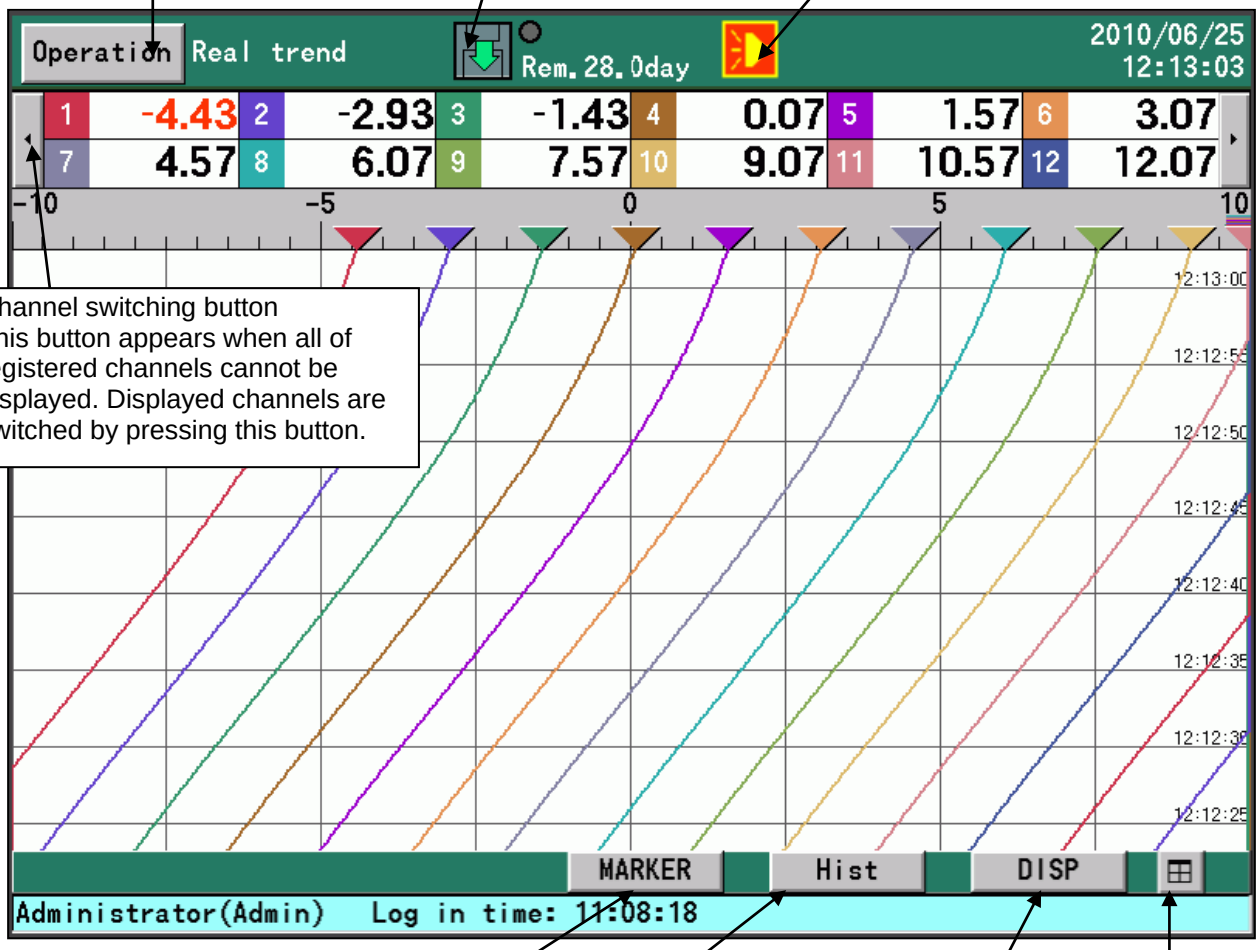
On this recorder, operations can be executed sensuously by tapping the touch panel. In this paragraph, the basic screen operation method is described. For operations specific to each screen, refer to "8 Names and functions of the operation screen".

6.4.1 Tapping on the operation screen

[Operation] button
Displays the operation menu.

Disk icon
Recording starts or stops by touching it.

Alarm icon
When an alarm is activated, the alarm is acknowledged by touching it.



Channel switching button
This button appears when all of registered channels cannot be displayed. Displayed channels are switched by pressing this button.

[MARKER] button
Writes a marker on the trends (refer to "9.1 Marker writing")

[DISP] button
Displays the DISP menu

[Hist] button
Displays a historical trend graph
When the historical trends are displayed, the button is changed to [Real] and, when the historical trends are displayed from a file list, etc., it is changed to [Return].

Separate screen button
Displays 4 separate screens.

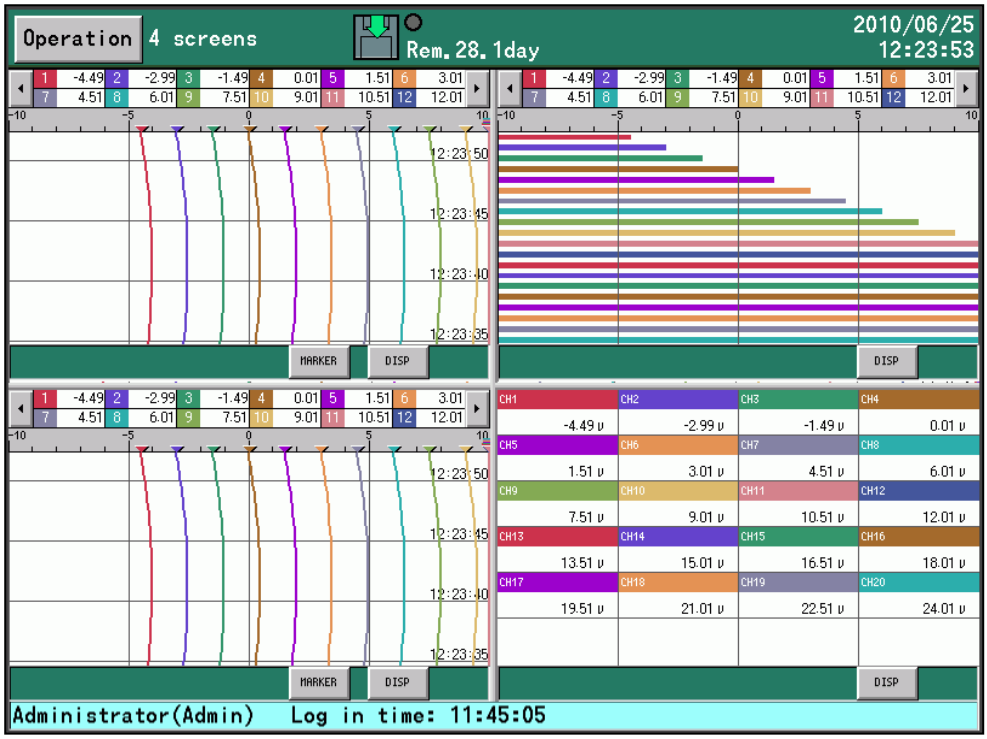
・[Operation] menu

Menu item	Operation
START	The recording starts. Same function as the START key
STOP	The recording stops. Same function as the STOP key.
HOME settings	The HOME settings open. Same function as the HOME key
MENU settings	The setting menu screen opens. Same function as the MENU key.
Password setting	The password setting screen opens.
Logout	Used to logout.

・[DISP] menu

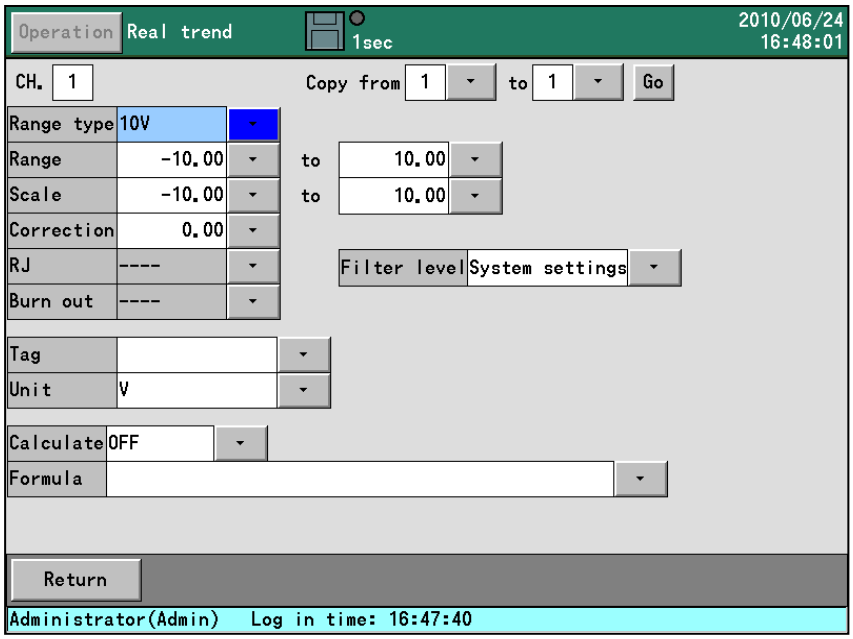
Menu item	Operation
Select display	Used to change the operation screen type.
Auto switching	Used to turn ON/OFF the automatic switching of channels. Check this item to turn on. This setting will be disabled when the automatic switching time is set to “0”.
Snapshot	Used to store a hardcopy of screens in the internal memory.
Pause	Screen updates are stopped except status bar. When press any key, the screen is displayed again. All operations except describing of data recording and recording processing are performed during pause. When the DISP key is pushed in the Pause, the Snapshot is executed.
Display OFF	Used to turn off LCD display. The LCD is turned on again by pressing any of buttons.
4 screens	Used to display 4 separate screens.
Magnify/reduce	The trends are displayed by compressing the time axis. (Same magnification to 1/60)
Password setting	Used to open the password setting screen (displayed by DISP key only).
Logout	Used to logout (displayed by DISP key only).

<Tapping operation on 4 separate screens>
Tap the [DISP] button to select a display type for each frame.
For the details of operation, refer to “8.13 Operation method of 4-screen split display”.

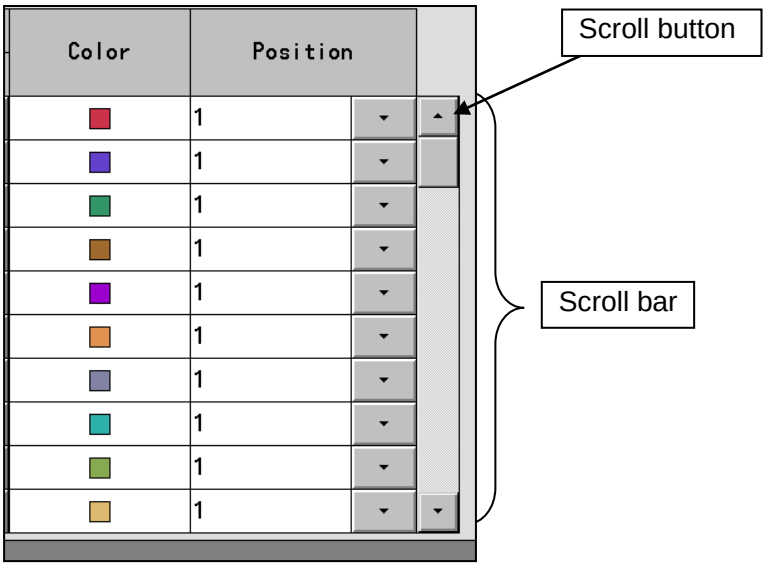


6.4.2 Tapping operation on the setting screen

Performing a setting by tapping an item on the setting screen enables more smooth operation for the setting. For inputting into each item, tap a button with the ▼ mark.
For returning to a previous screen, press the [Set] button.



On a screen with a scroll bar, information can be scrolled with tapping the scroll button. The screen is scrolled one by one by tapping the scroll bar above or below the scroll bar.



⚠ Caution

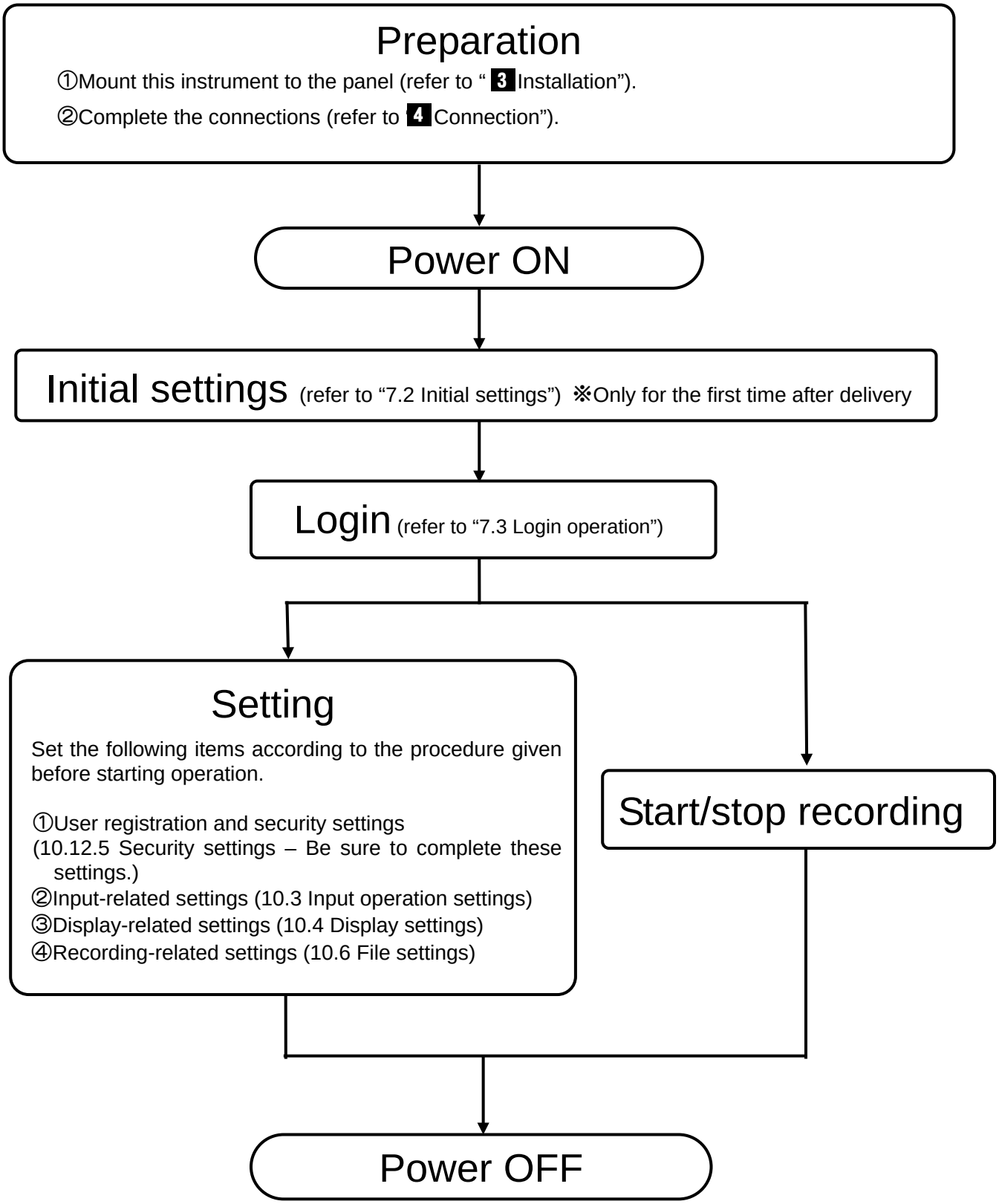
■Cautions for using the touch panel.

- Do not rub or push the touch panel by a sharp edged tool or a sharp material.
- Avoid storing and using the touch panel in the environment with water, organic solvent or acid, or in the condition of touching them.
- Avoid using the touch panel in a place with direct sunlight.
- For dirt on the front glass, wipe it lightly with a soft cloth infiltrated with neutral detergent or alcohol into soft cloth. When medicine, etc. adheres to the touch panel accidentally, wipe off it immediately in the state where there is no influence in a human body.
- The dew condensation generated inside the touch panel is not unusual since the dew condensation is a natural phenomenon. When the temperature of the touch panel reaches to the room temperature, the dew condensation will disappear automatically, but avoid using the touch panel with the dew condensation since it causes failure.

7 Operation (Be sure to read section 1 to ensure safety.)

7.1 Operation procedure

Default values are set at factory before shipment. Be sure to set the following items before you start actual operation.



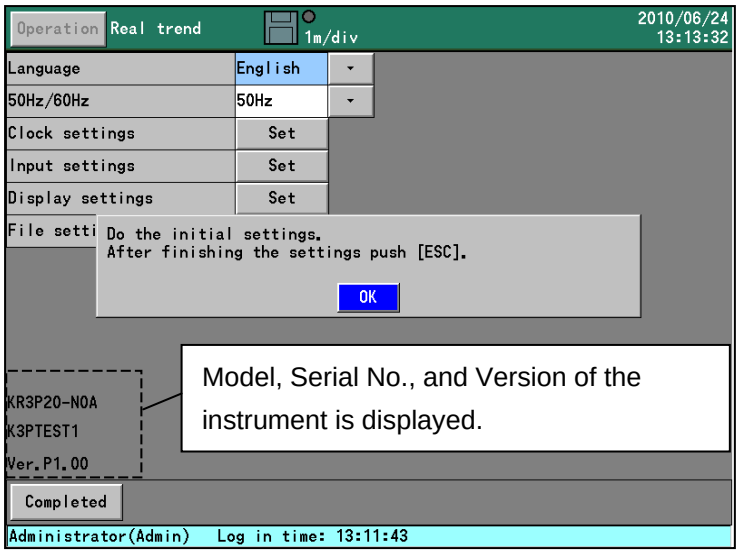
- There may be some pixels always kept illuminated or unilluminated on the LCD screen, and also there may be unevenness in brightness. However, these are not signs of malfunction since these cases can occur due to the nature of LCD.

7.2 Initial settings

When you first turn on the power after the delivery of the instrument or initializing the settings, the initial settings screen will be displayed. Set the following parameters which are the minimum requirements for operation.

- Language
- Power frequency 50Hz/60Hz
- Clock settings
- Input settings
- Display settings
- File settings

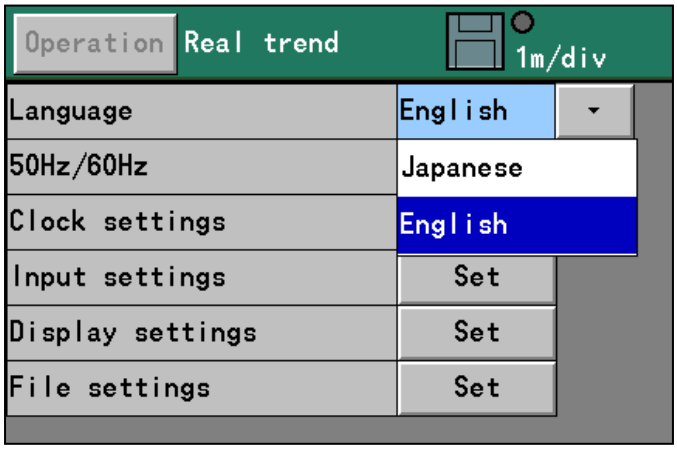
You can leave these items without setting. In this case, default settings will be effective.



Tap the [OK] button to delete the message and start the settings.

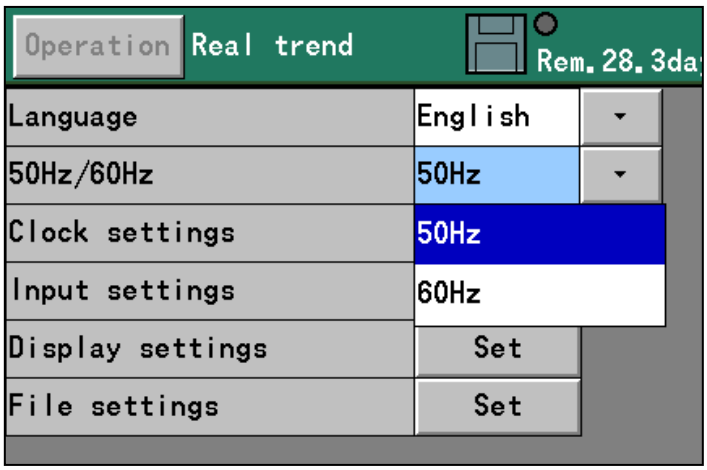
①Language setting

Tap the ▼ button beside “Language” to show the pulldown menu.
Tap either “Japanese” or “English” in the pulldown menu to set it.



②Power frequency setting

Tap the ▼ button beside “50Hz/60Hz” to show the pulldown menu.
Tap either“50Hz” or “60Hz” in the pulldown menu to set it. Check the frequency of the power supply you use before setting this item.

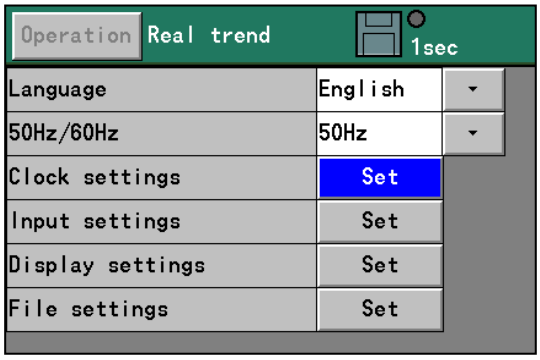


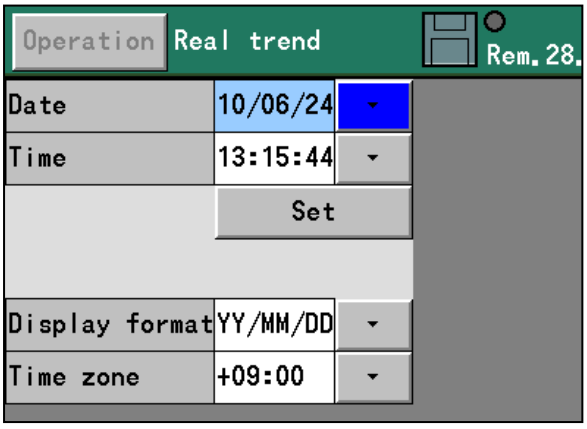
Reference About power frequency setting

This setting is used for input noise (power frequency) filtering.
Make sure to set this to 60Hz when you use the instrument in the 60Hz band and there is an influence of power frequency noise (setting to 60Hz may improve the noise removal characteristic).

③Clock settings

Tap the [Set] button beside “Clock settings” to display the following clock settings screen.

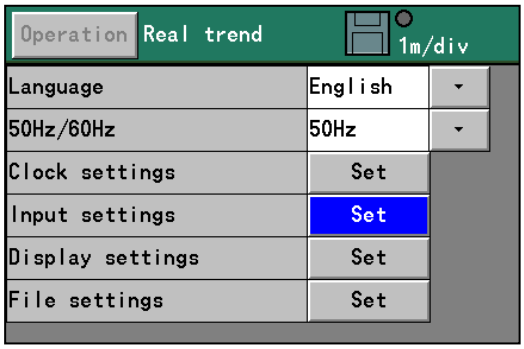


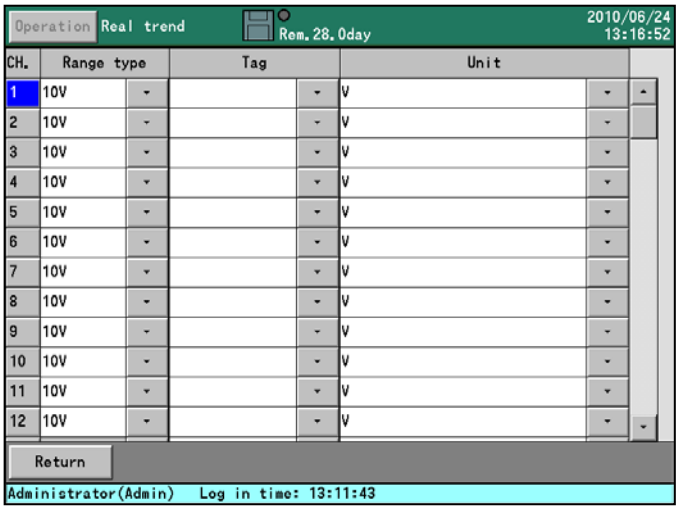


※For detailed settings, refer to “10.12.1 Clock settings”.

④Input settings

Tap the [Set] button beside “Input settings” to display the following input settings screen.

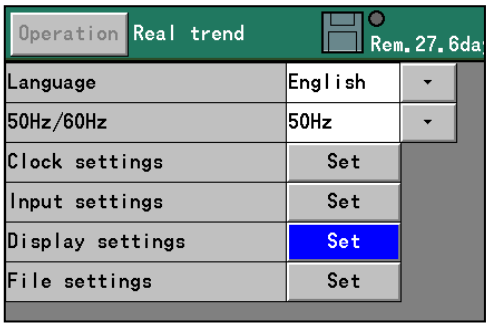


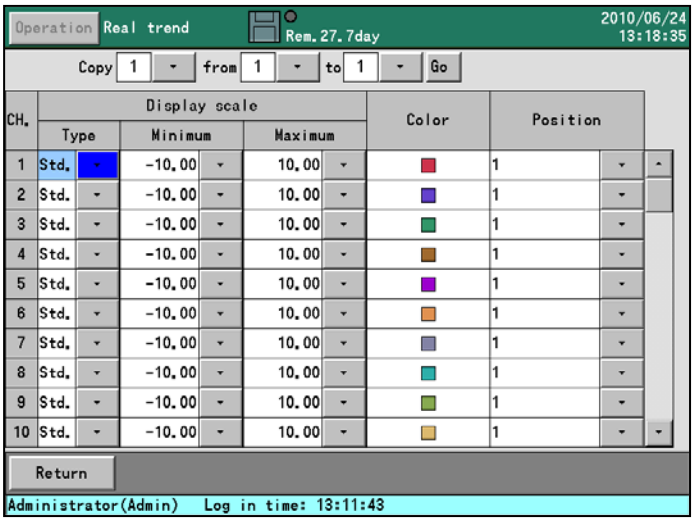


※For detailed settings, refer to “10.3 Input operation settings”.

⑤Display settings

Tap the [Set] button beside “Display settings” to display the following display settings screen.

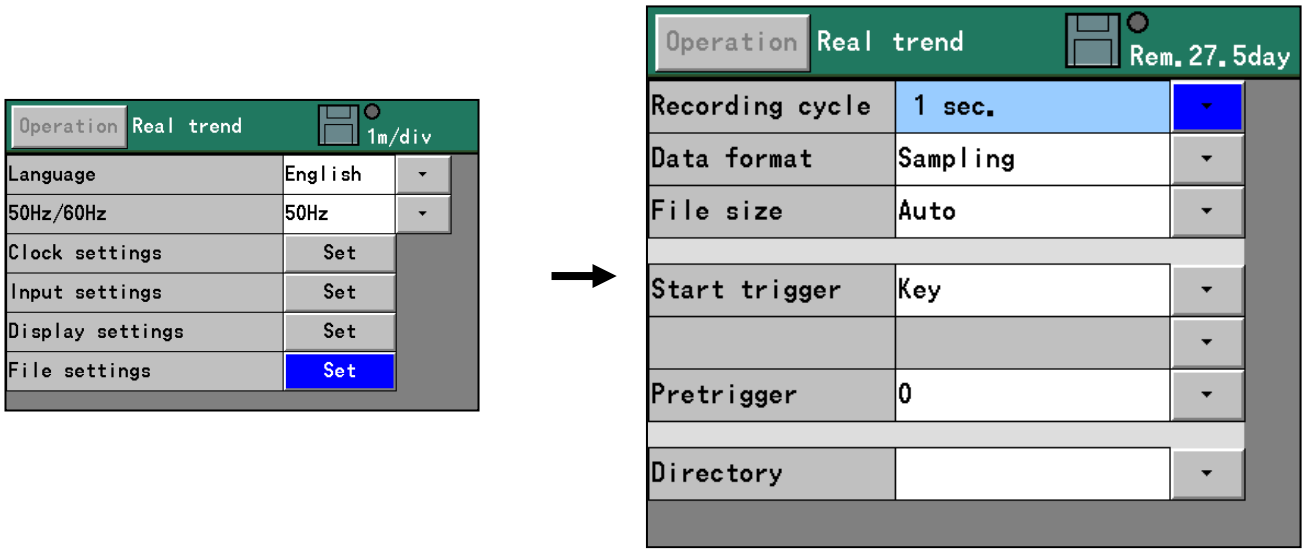




※For detailed settings, refer to “10.4.1 Channel parameters”.

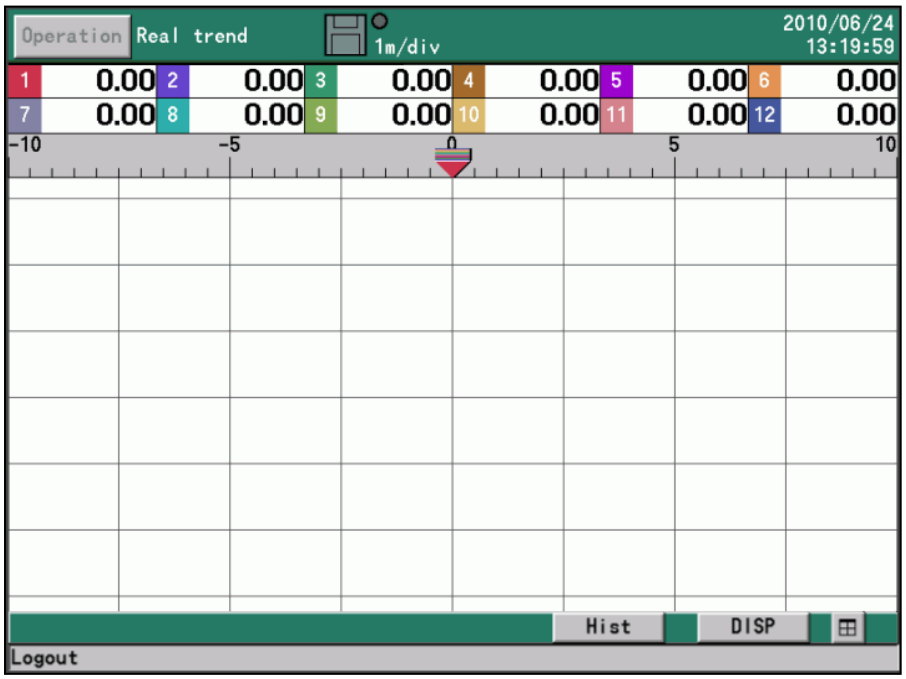
⑥File settings

Tap the [Set] button beside “File settings” to display the following file settings screen.



※For detailed settings, refer to “10.6 File settings”.

⑦Tapping the [Completed] button displays the trend screen.



⑧Proceed to the login operation (refer to “7.3 Login operation”).

7.3 Login Operation

7.3.1 Outline

This instrument is operated by two types of users: administrator user and general user. See the following table for details of each user.

User type	Operation	Max number of users	Main purpose of login
Administrator user	All settings and operations	5	Initial settings, change of security settings, significant setting change due to system change, etc.
General user	Limited settings and operations (Authority level can be set)	100	Regular operations such as changing settings for each operation, monitoring and handling recorded data.

※You must login to use this instrument with user ID and password. Login is not necessary for initial settings which you perform after the delivery of the instrument, but it will be required after completing the initial settings.

※User passwords should be kept confidential.

※Change a user password immediately if it is revealed (or potentially revealed) to anyone (refer to “7.7 How to change login password”).

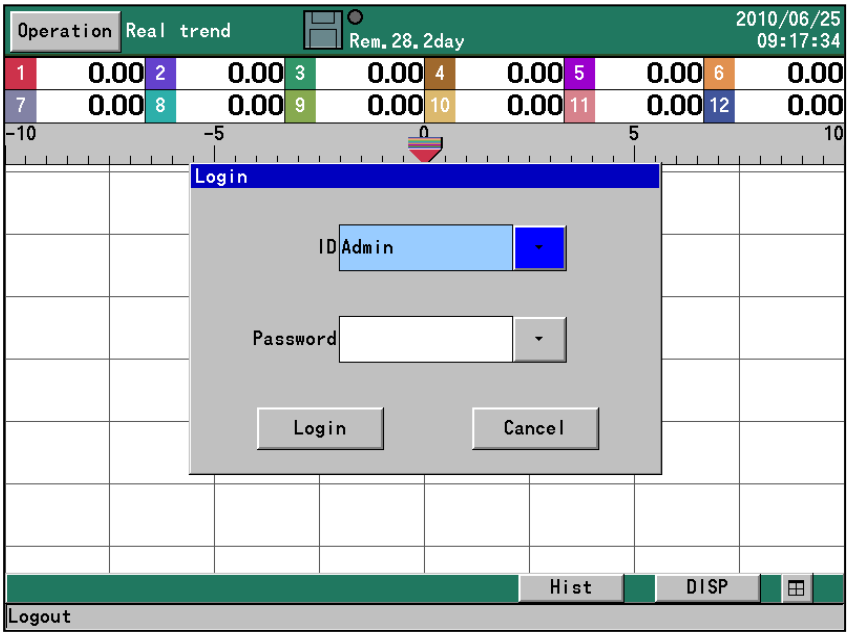
※Make sure to complete user registration when you first turn on the instrument after delivery. Refer to “7.6 User registration” for procedure.

7.3.2 Initial login (after delivery)

When you first login after the delivery of the instrument, you need to set a login password.

<Login steps>

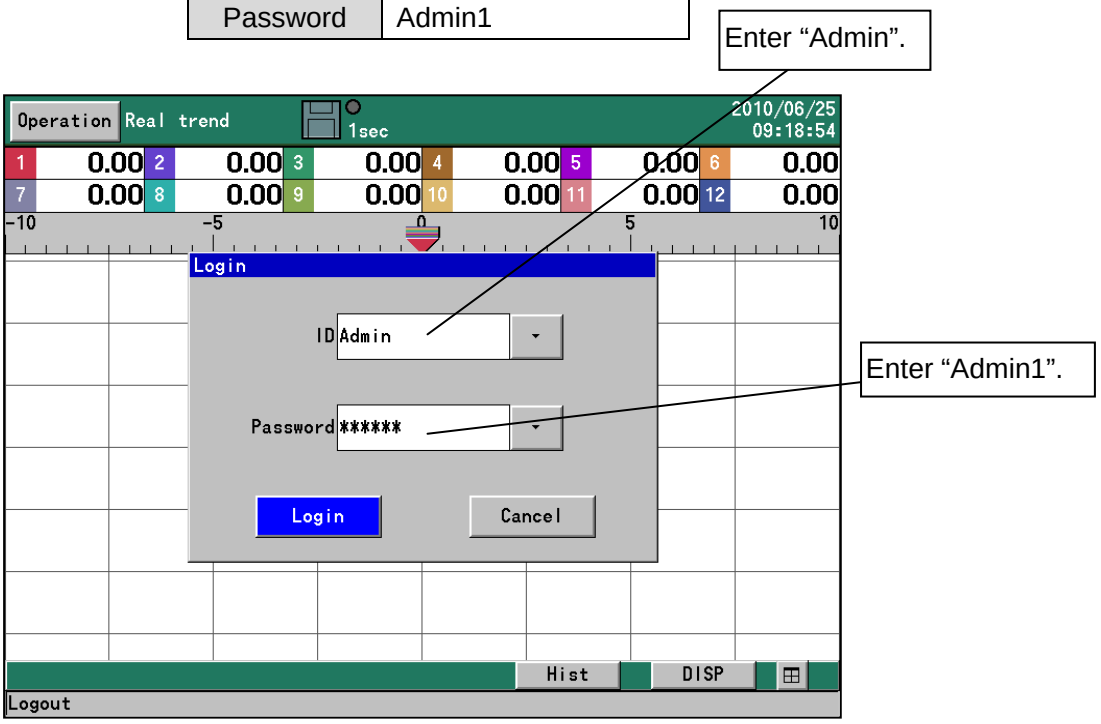
①Touching any part of the touch panel displays the login screen.



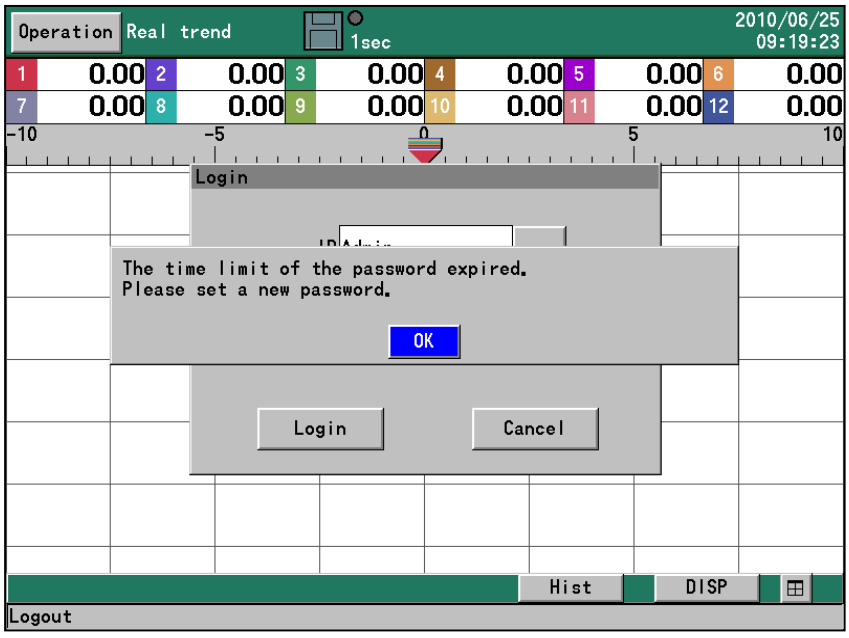
②Enter an administrator user ID and password.

Defaults are shown below.

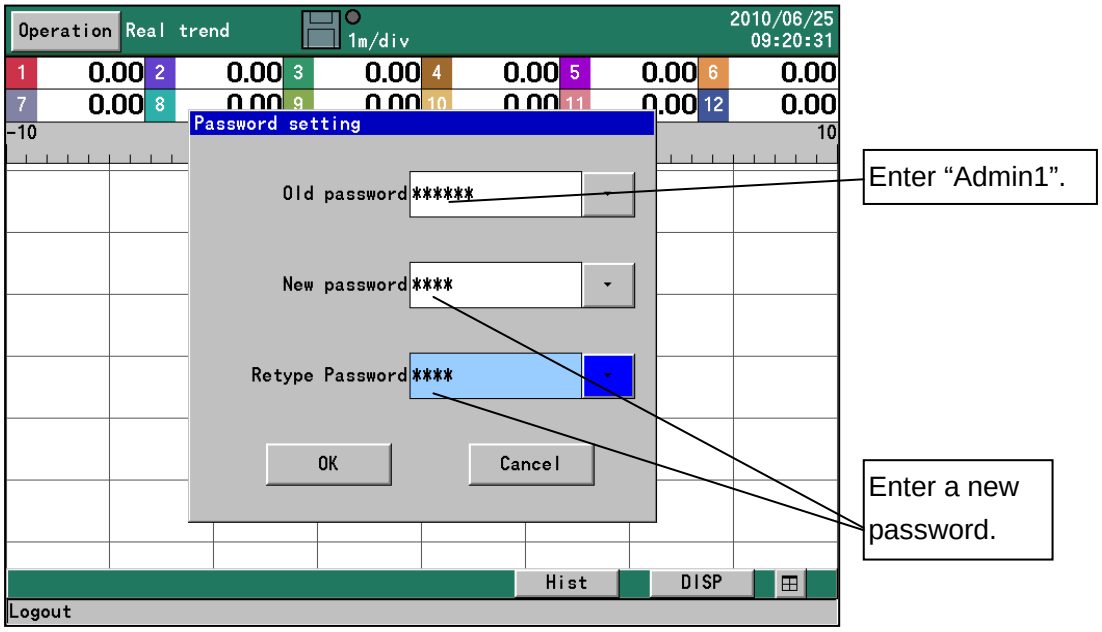
ID	Admin
Password	Admin1



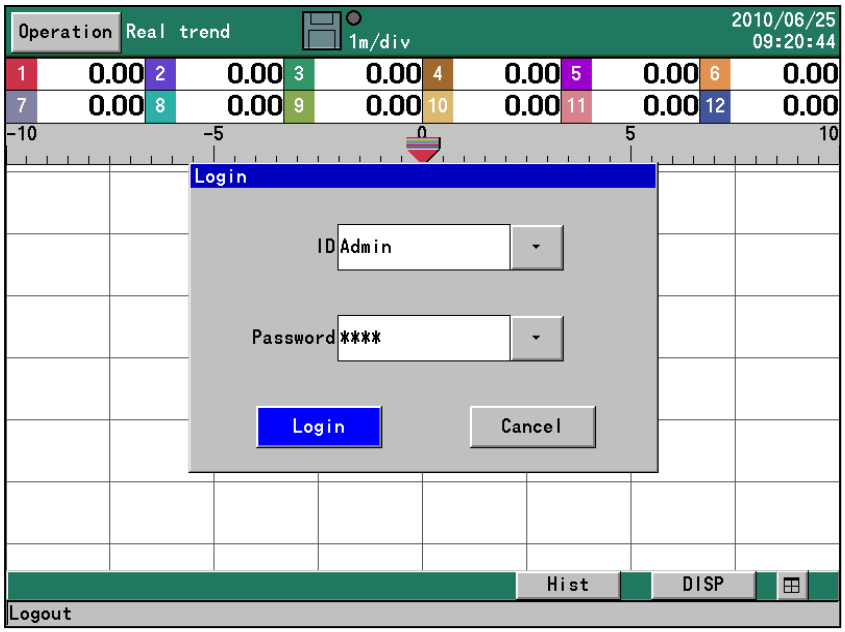
When you tap the [Login] button, the message “Please set a new password” will be displayed.



③Enter an old and new passwords and then tap the [OK] button.



④Tap the [Login] button to login.



⑤Proceed to user registration with reference to “7.6 User registration”.

Remarks About user registration

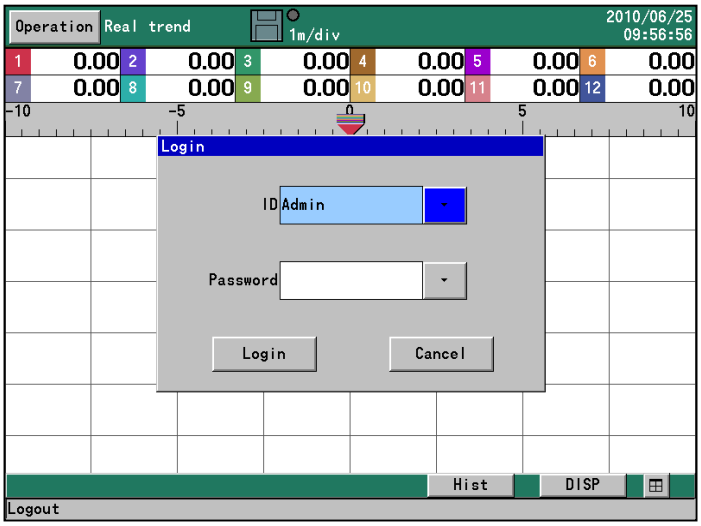
Register two or more administrator users. Keep the passwords secure and be careful not to forget them. In case that all the registered administrator users become unable to login (lock-out), an administrator user login will become impossible from that time forward. In this case, contact your nearest CHINO office.

7.3.3 Initial login (for newly registered user)

You need to set a login password for a newly registered administrator/general user. Refer to “7.6 User registration” for details.

<Login steps>

① Touching any part of the touch panel in the logout status displays the following login screen.



② Enter user ID and password.

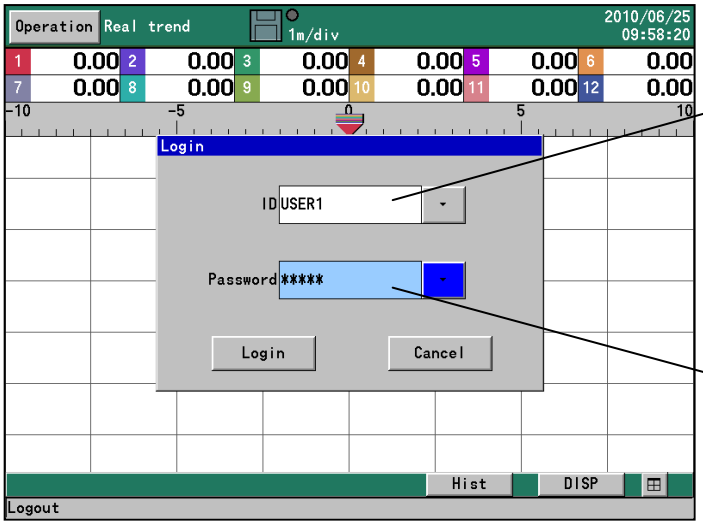
Enter a password according to the tables below. See the table on the left for administrator user, and the table on the right for general user.

<Default passwords of administrator user>

	Default password
Administrator user 1	Admin1
Administrator user 2	Admin2
Administrator user 3	Admin3
Administrator user 4	Admin4
Administrator user 5	Admin5

<Default passwords of general user>

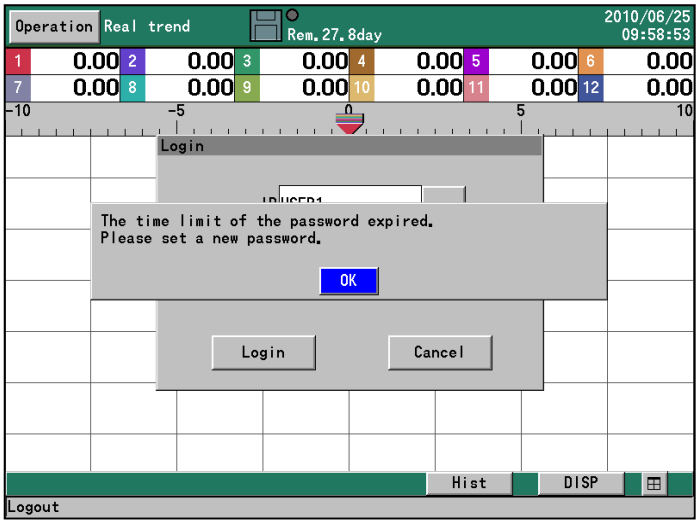
	Default password
General user 1	User1
General user 2	User2
:	:
:	:
General user 100	User100



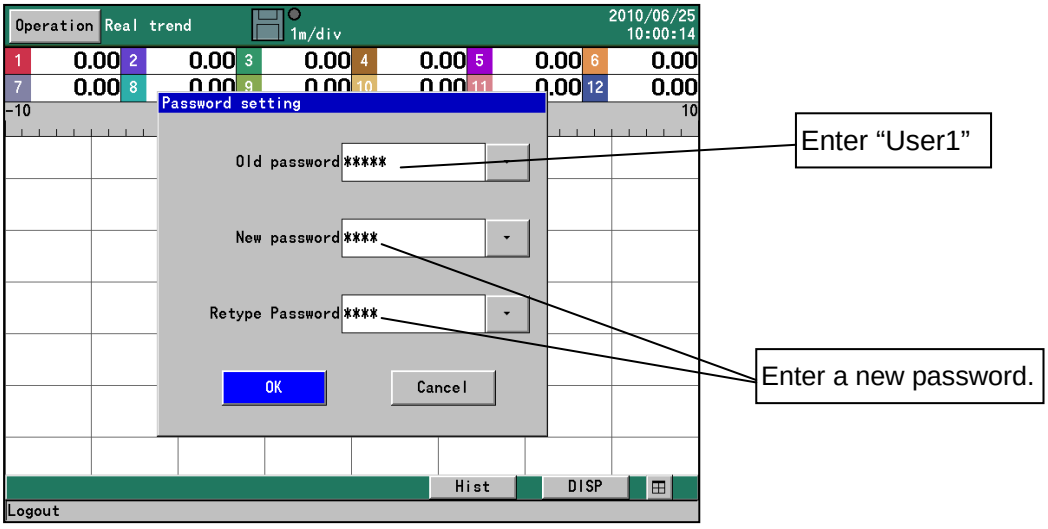
Enter a registered administrator/general user ID.
In this example, “User1” is entered as the ID of the general user 1.

Enter a default password.
In this example, “User1” is entered since the user ID is general user 1.

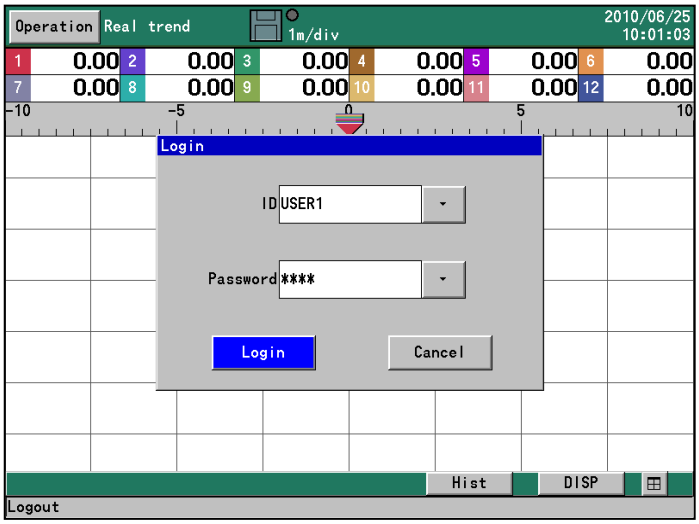
③ When you tap the [Login] button, the message “Please set a new password” will be displayed.



④ Enter an old and new passwords and then tap the [OK] button.



⑤ Tap the [Login] button to login.

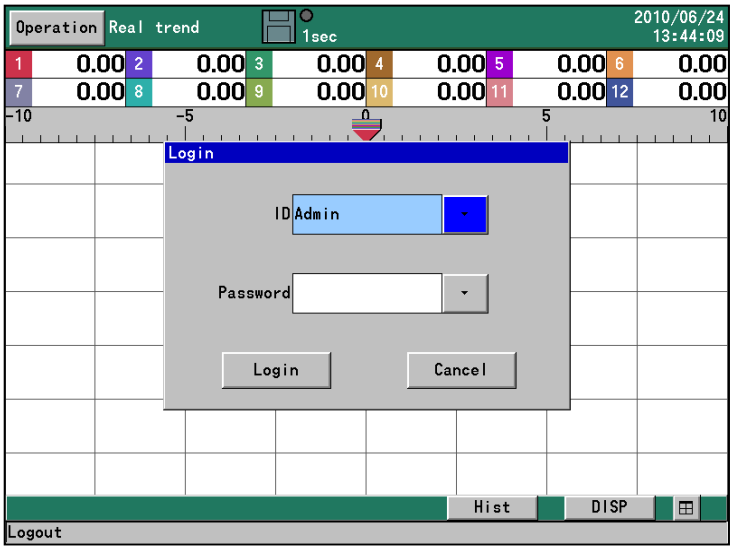


⑥ You can login with the normal steps from the next time (refer to “7.3.4 Normal login”).

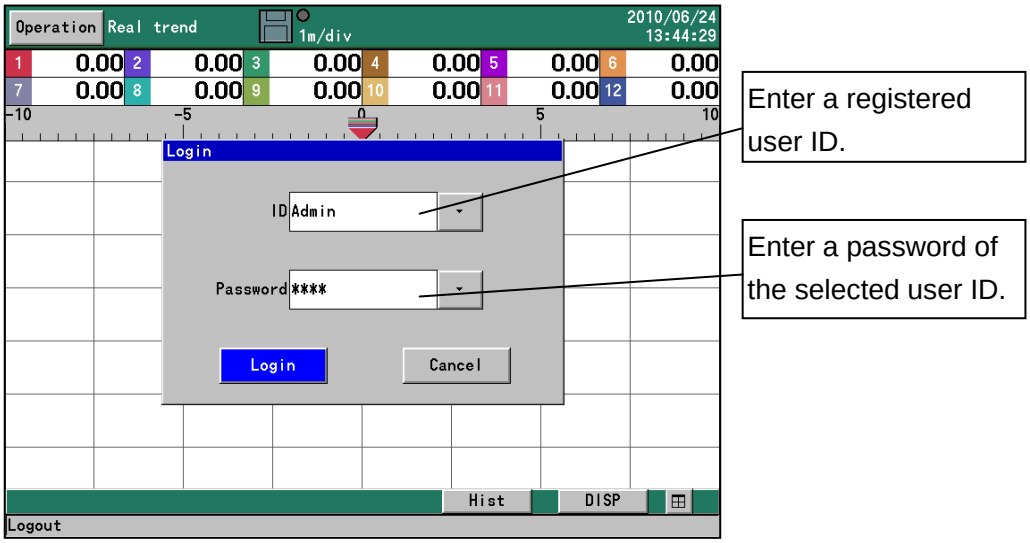
7.3.4 Normal login

<Normal login steps>

① Touching any part of the touch panel displays the following login screen.



② Enter user ID and password.

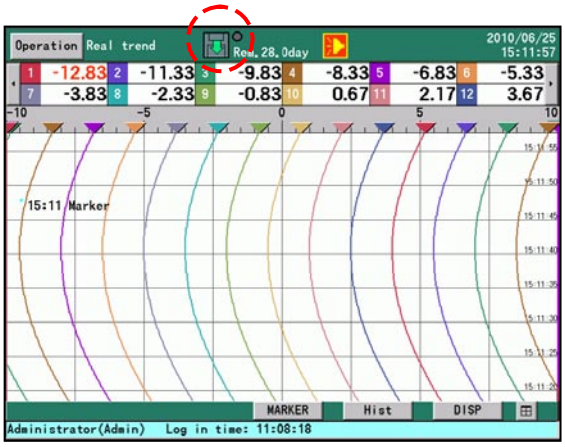


③ Tap the [Login] button to login.

7.4 Start/stop operation of recording

[Start recording]

- Tap the disk icon located in the upper part of the screen.
- Press the START key.



[Stop recording]

- Tap the disk icon located in the upper part of the screen.
- Press the STOP key.

7.5 Logout

- Tap the [Operation] button or press the DISP key and select [Logout] from the displayed menu.
  ※When you tap the [Operation] button on the historical/dual trend screen, [Logout] does not appear in the menu.
- Execute a logout from the DISP key menu.
  ※When the automatic logout time is set, logout is executed when the preset time has passed.

7.6 User registration

7.6.1 Administrator user registration

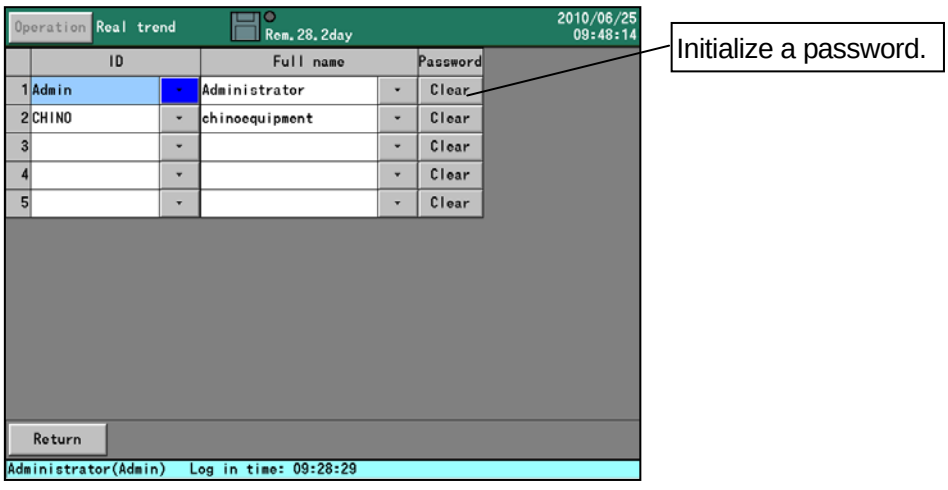
On the setting menu screen, tap [System settings] - [Security settings] - [Administrator user settings] to display the following screen. You can register as an administrator user or initialize a password from this screen.

- Enter ID and full name.
- Refer to “7.3.3 Initial login (for newly registered user)” for login operation.

※Make sure to register two or more administrator users.

※You cannot set previously used IDs and full names (up to 1000 previous IDs/full names).

<Administrator user registration screen>



ID	Set a login ID required when you login to the instrument.
Full name	Set a user name displayed in the lower left of the screen.

<Administrator user default passwords>

	Default password
Administrator user 1	Admin1
Administrator user 2	Admin2
Administrator user 3	Admin3
Administrator user 4	Admin4
Administrator user 5	Admin5

Remarks About user registration

Register two or more administrator users. Keep the passwords secure and be careful not to forget them. In case that all the registered administrator users become unable to login (lock-out), an administrator user login will become impossible from that time forward. In this case, contact your nearest CHINO office.

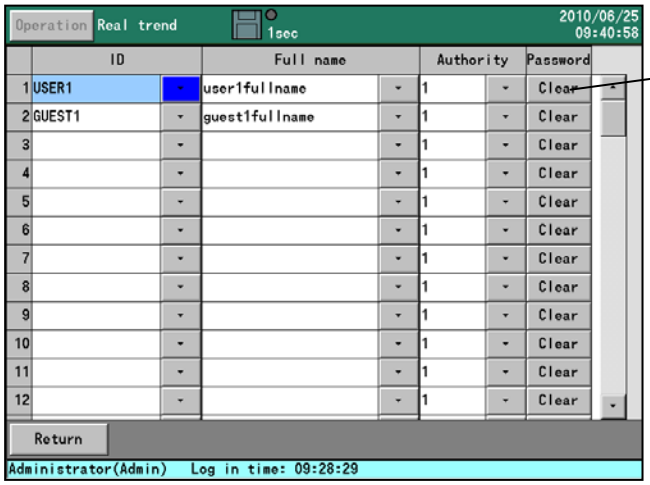
7.6.2 General user registration

On the setting menu screen, tap [System settings] - [Security settings] - [General user settings] to display the following screen. You can register as a general user, initialize a password or set an authority level from this screen.

- Enter ID, full name and authority level.
- Refer to “7.3.3 Initial login (for newly registered user)” for login operation.

※You cannot set previously used IDs and full names (up to 1000 previous IDs/full names).

<General user registration screen>



Initialize a password. Refer to “7.7 How to change login password” for password setting.

ID	Set a login ID required when you login to the instrument.
Full name	Set a user name displayed in the lower left of the screen.
Authority	Set the functions used by general user (refer to “10.12.3 Security settings”).

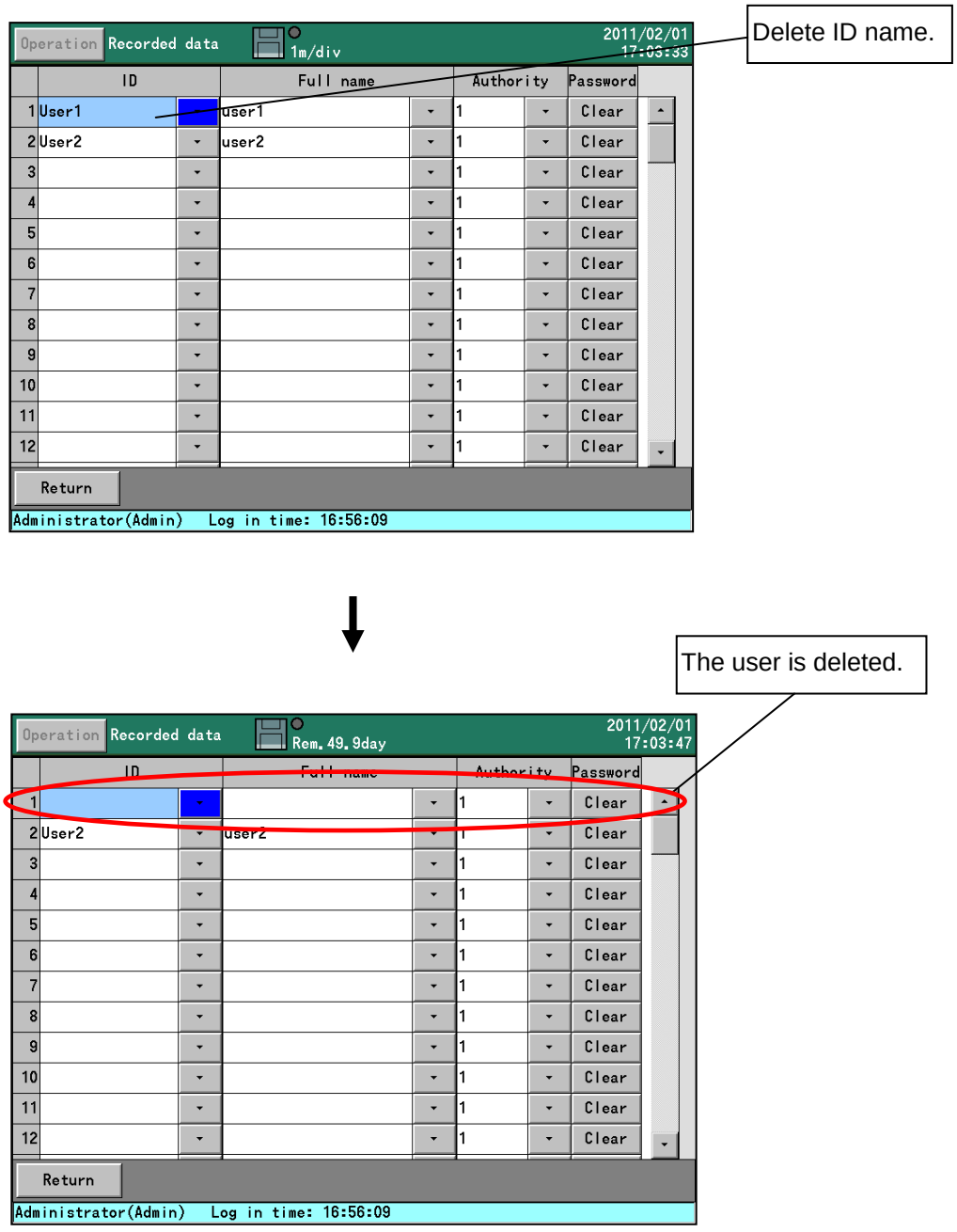
<General user default password>

	Default password
General user 1	User1
General user 2	User2
:	:
:	:
General user 100	User100

7.6.3 User deletion

- From the setting menu, tap [System settings] – [Security settings] – "Administrator user settings" or "General user settings" to display the following screen.
- Delete the ID name of the user you wish to delete.
  ※You cannot delete the ID of an administrator user who is currently logging in.

<General user registration screen>

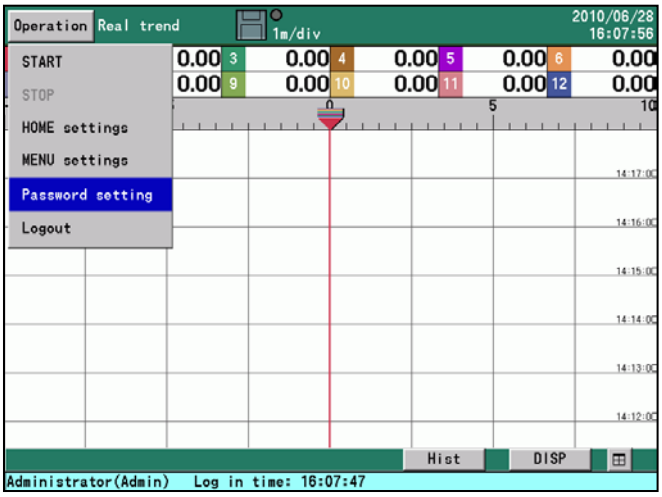


7.7 How to change login password

①Tap the [Operation] button or press the DISP key on the real trend screen and select [Password setting] from the menu.

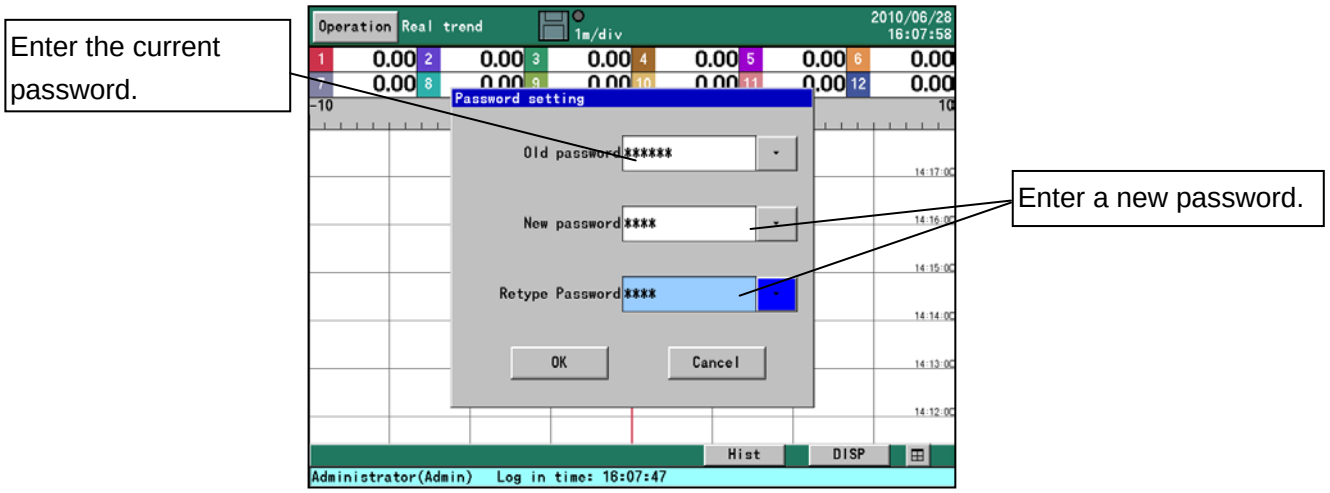
※When you tap the [Operation] button on the historical/dual trend screen, [Password setting] does not appear in the menu. In this case, press the DISP key to change a password.

＜Trend screen＞



②Enter the current password and a new password. After that, tap the [OK] button.

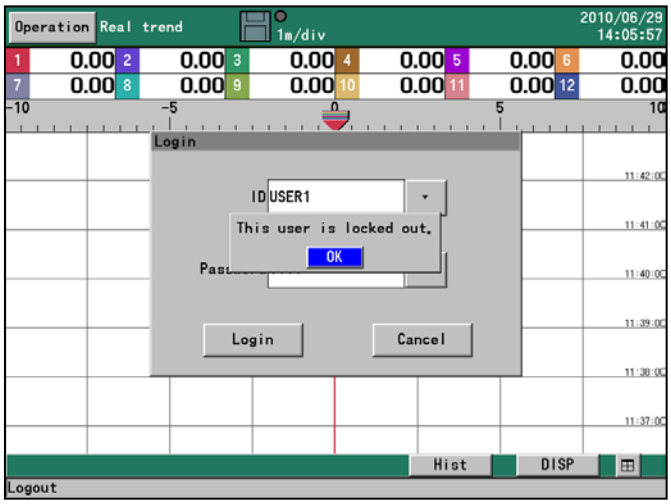
<Password setting screen>



7.8 How to cancel lock-out

・ If a failed login attempt exceeds the limit, further login attempts by the user will be blocked (lock-out)
※Threshold for login failure can be changed according to “10.12.3 Security settings”.

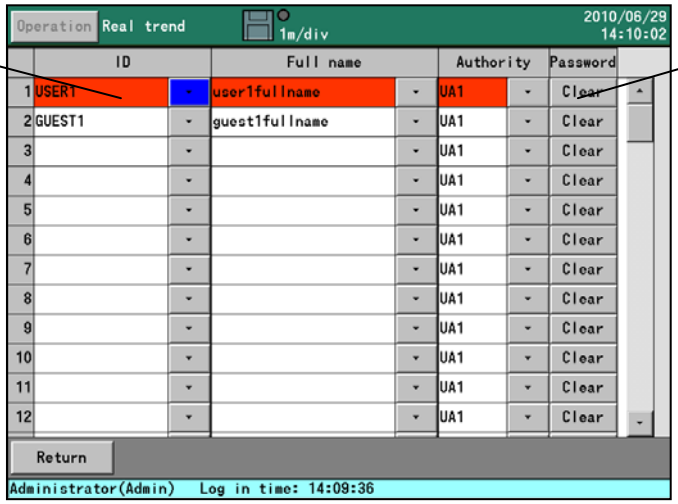
<Login screen (locked out)>



・ To cancel lock-out, you need to login as an administrator user and clear the password of the user being locked out. After clearing the password, the default password will become effective
※If an administrator user is locked out, another administrator user can cancel lock-out by taking the steps above.

<General user setting screen>

The user being locked out is highlighted in red.



Lock-out can be cancelled by tapping the [Clear] button of the password.

8 Names and functions of operation screen

8.1 Common operations of the operation screen

(Using method of each key)

START

The recording is started and the data is stored in the internal memory when the recording conditions are met. When the recording conditions are not met, the instrument will be put into a standby state and will start recording when the conditions are met. If a deviation from the recording conditions occurs, the instrument will be put into a standby state.
(Tapping operation)
Tap the [Operation] button. Then tap the [START] or the disk icon.

STOP

The recording is stopped.
(Tapping operation)
Tap the [Operation] button. Then tap the [STOP] or the disk icon.

DISP

The DISP menu is displayed.
(Tapping operation)
Tap the [DISP] button.

Menu item	Operation
Select display	Used to change the operation screen type.
Auto switching	Used to turn ON/OFF the automatic switching of channels. The switching becomes active by checking. When the automatic switching time is set to 0, this switching is not valid.
Snapshot	Used to store a hardcopy of screens into the internal memory.
Pause	Screen updates are stopped except status bar. When press any key, the screen is displayed again. All operations except describing of data recording and recording processing are performed during pause. When the DISP key is pushed in the Pause, the Snapshot is executed.
Display OFF	Used to turn off LCD display. The LCD is turned on again by pressing any of buttons.
4 screens	Used to display 4 separate screens.
Magnify/reduce	The trends are displayed by compressing the time axis. (Same magnification to 1/60)
Password setting	Used to open the password setting screen (refer to “7.7 How to change login password”).
Logout	Used to logout.

HOME

The specifications confirmation screen is displayed
(Tapping operation)
Tap the [Operation] button and then tap [HOME settings].

MENU

The screen of each setting is displayed.
(Tapping operation)
Tap the [Operation] button and then tap [MENU settings].

ENTER

The ENTER menu is displayed. Menu contents differ depending on the screens.

(Tapping operation)

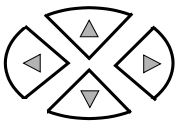
The operation differs depending on the screens.

ESC

The screen is returned to a previous screen. In case of the screens of the real time trend, the bar graph and the numerical display, the screens do not return to a previous screen.

(Tapping operation)

Tap the [Return] button. (On the setting screen)



For the vertical trend

A display channel is switched to another one with the left and right keys.

For the horizontal trend:

A display channel is switched to another one with the up and down keys.

(Tapping operation)

Not available

(Displayed data)

Measured data displayed on each screen

Measured data	Contents
(Numeric value)	The values are displayed based on the display scale settings of each channel. The values are displayed with the number of digits after decimal point of the maximum and minimum values of the display scale.. When the type is “Exponent”, the values are displayed in such exponential format as”1.2E+3”. In this case, up to 2 digits after the decimal point of the significand can be set but only 1 digit is displayed depending on the screen.
BURN	Input signal of thermocouple input or resistance thermometer input is interrupted.
OVER	A value above the measurable high limit value (upper limit value + 5% of range) is inputted. Or calculated value is above the value that can be indicated (*).
UNDER	A value below the measurable low limit value (lower limit value - 5% of range) is inputted. Or calculated value is below the value that can be indicated (*).
CAL ER	Calculation error occured.
RJ ERR	The recorder is abnormal.

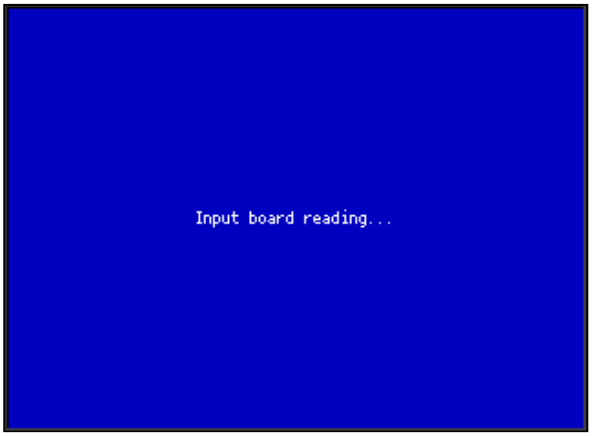
※Range that can be indicated for calculated result as follows.

- Display format is “standard”
  Numeric value that exclude decimal point is within ±30000 (Example: -30.000 to +30.000)
- Display format is “index”
  1.00E-15 to 9.99E+15

Excluding the historical data displayed part of the historical trends and the dual trends, the current data (with 0.5 second interval) irrespective of the recording interval, etc. is displayed as the numeric displayed data. For slowing down the updating speed, change “Numeric value display update interval”. (refer to “10.4.4 Common parameters”)

※At power on

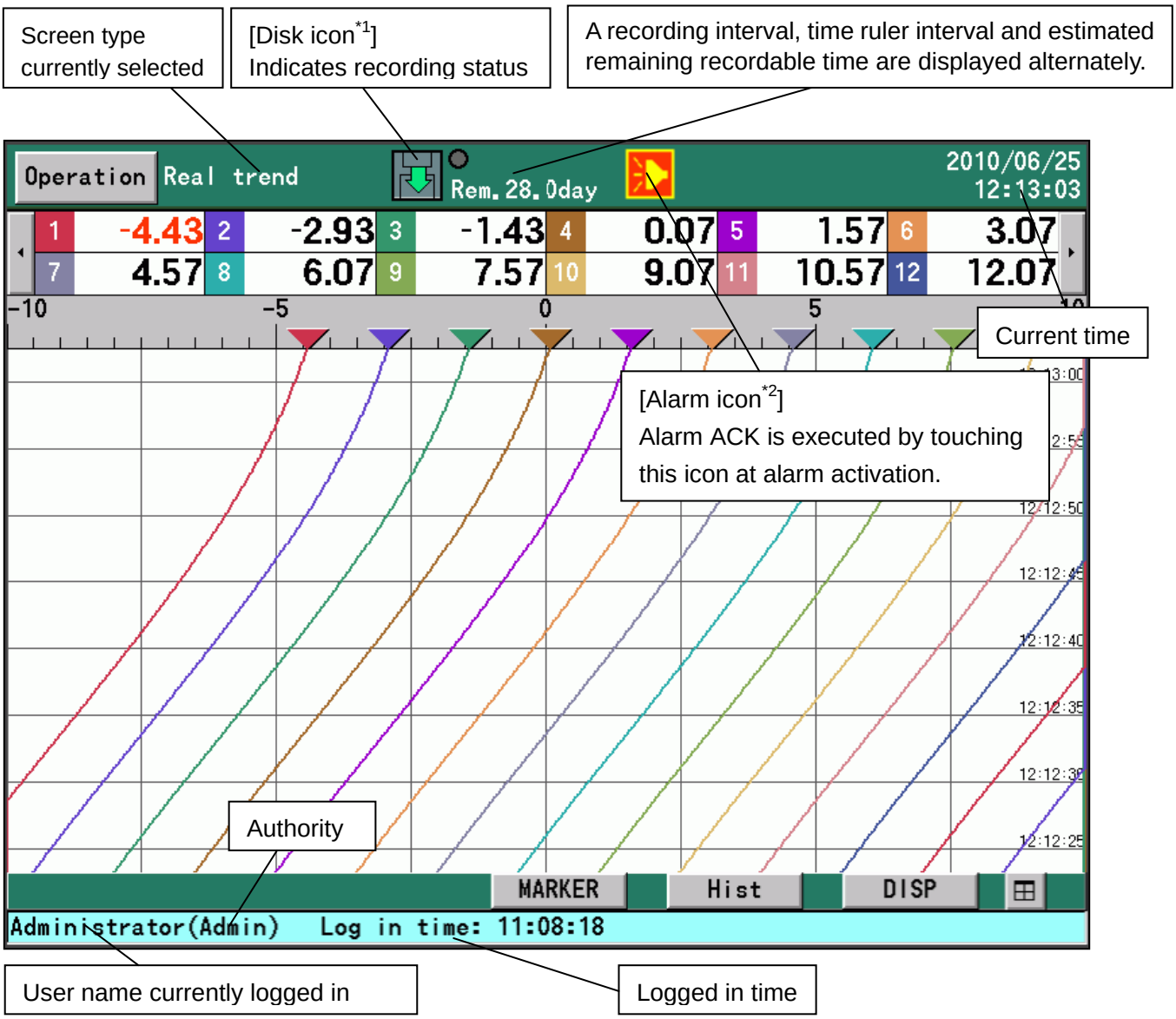
After the power is turned on, messages in the table below are displayed on the blue screen.



Message	Description
Initializing...	Setting file is being read.
Input board reading...	Model discrimination/communication check is being executed for an input device.
Input board writing...	Setting of an input device is being executed.
Reading File...	Measurement data is being read from internal memory.

8.2 Operation screen

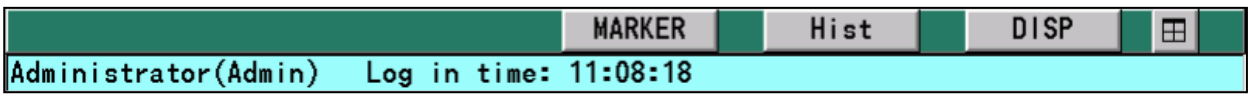
- The status bar and login bar are displayed always on the top and bottom of the screen respectively to show information such as the instrument status.
- Normally the background color is green, but it turns grey outside the scheduled period if you set a schedule (refer to “10.8 Schedule settings”).



(Color of login bar)

The color of the login bar is light blue in a login state, and gray in a logout state.

<At login>



<At logout>

※1 Disk icon

The arrow indicates the recording status.

Arrow	Status
Displaying vertically.	Recording
Blinking.	The START key was pressed but the recording is in the standby state since recording conditions are not established.
Not displayed.	Recording is stopped.

Background color is used to indicate the status of the internal memory.

Back color	Status
Gray	The remaining space of the internal memory is 11% or more.
Yellow	The remaining space of the CF card is less than 10%.
Red	The remaining space of the internal memory is 8 Mbytes or less.

The indicator lamp located at the upper right of the icon shows the access status to the internal memory.

Color	Status
Gray	No access is made to the internal memory.
Yellow	Writing in the CF card is executed within about 5 seconds.
Red	Accessing to the internal memory.

※2 Alarm icon

The icon shows the activation status and the confirmation status of alarms. The confirmation (ACK) of alarm is executed with the ENTER menu or by tapping on the alarm icon on the operation screen.

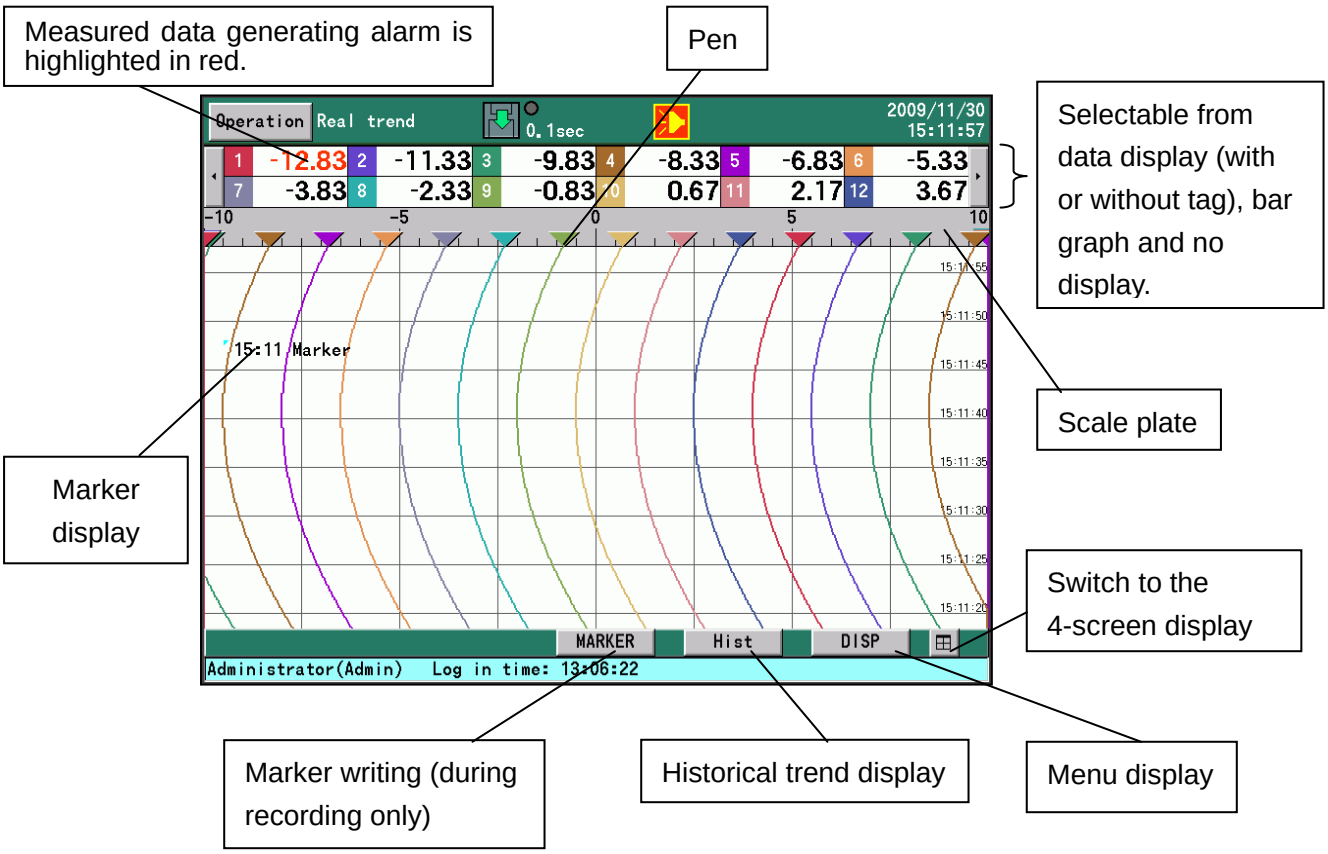
Icon status	Alarm status	Confirmation (ACK) status
Lit	Activated	Confirmed
Icon inside blinking	Activated	Not confirmed yet
Icon blinking	After released	Not confirmed yet
Not displayed	After released or not activated	—

8.3 Real time trend screen

- The trends of measured values can be seen like an analog recorder. The pens are displayed on the scale plates corresponding to the values of “Display position” parameters of each channel.
- When the same “display position” is set to multiple channels, the scale plate, trend and pen are displayed using the display scale of the channel of the smallest number.

[Display style]

• Tap the [DISP] button and select “Real trend” from the menu.



Tapping the [Operation] button displays the following menu.

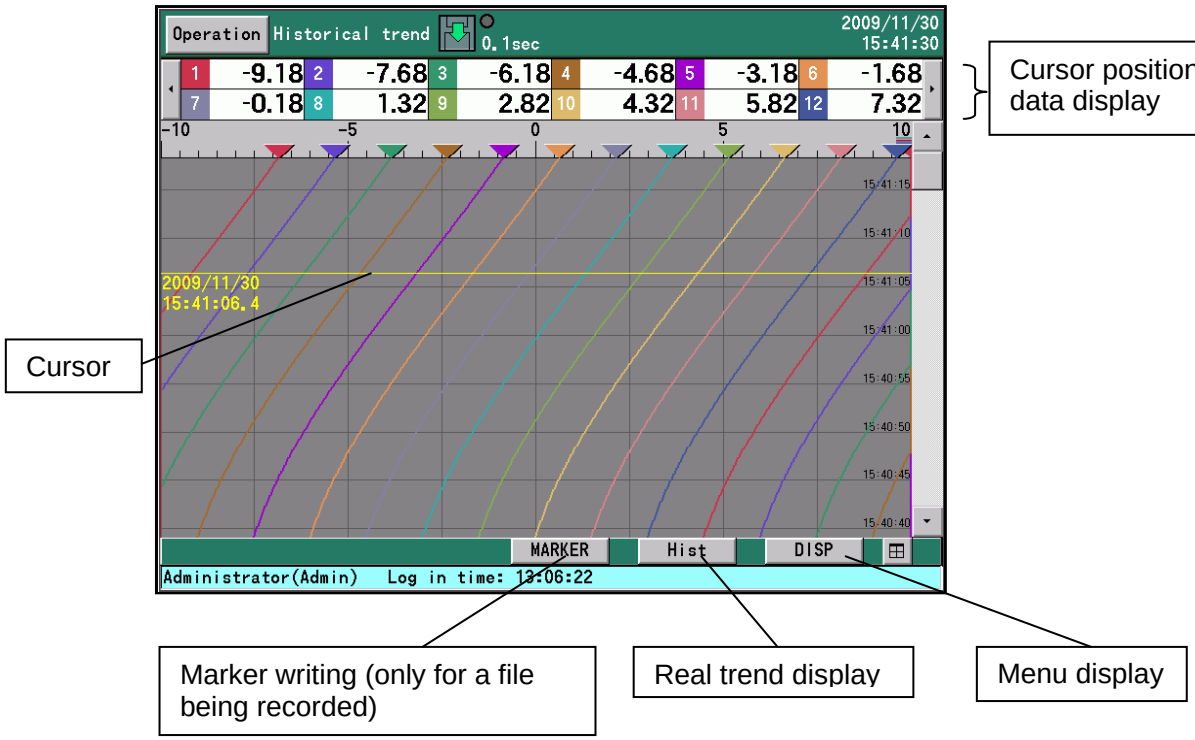
Menu item	Operation
START	The recording starts.
STOP	The recording stops.
HOME settings	The specifications confirmation screen opens.
MENU settings	The setting menu screen opens.
Password setting	The password setting screen opens (refer to “7.7 How to change login password”).
Logout	Used to logout.

8.4 Historical trend screen

- Recorded data in the internal memory is displayed.
- A cursor can be displayed by touching the trend data. You can view a measured value at a specific time corresponding to the cursor position.

[Display style]

- Tap the [DISP] button and select “Historical trend” from the menu, or press the SCROLL key on the real time trend screen. The latest data will be displayed.
- Tap the [DISP] button and select a file from the “Recorded data” screen in the menu. The recorded data of the selected file is displayed.

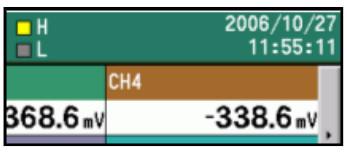


Tapping the [Operation] button displays the following menu.

Menu item	Operation
Alarm ACK	Acknowledge alarm (displayed only when alarm is generated).
Magnify/reduce	Zoom in/out the trend display (from the same magnification to 1/60).

When the data format of a display file is set to “highest/lowest”, “H” and “L” are displayed in the upper right of the screen as shown in the right figure. This indicates that the currently displayed value is the highest value or lowest value.

To switch between them, tap “H” or “L” icon or press the HOME key.

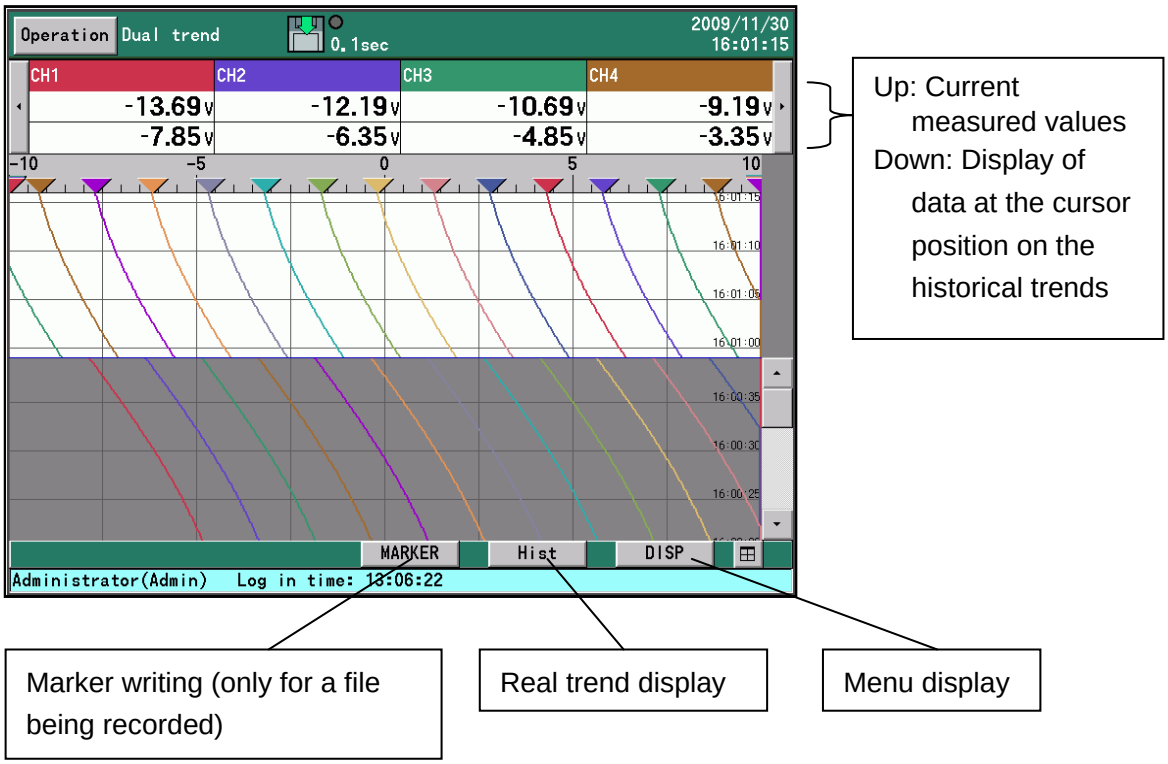


8.5 Dual trend screen

- The real time trends and the historical trends are displayed by dividing the screen up and down, and the current data and the past data can be compared. Also the data display displays the current values and values at the cursor position of the historical trends by dividing the screen up and down.
- The displaying method of the trends and positions of pens is same as the real time trend screen. However, in case of the setting that multiple scale plates are displayed, only 1 scale plate is displayed, and the numeric values on the scale plate are not displayed.

[Display style]

- Tap the [DISP] button and select “Dual trend” from the menu.



Tapping the [Operation] button displays the following menu.

Menu item	Operation
Alarm ACK	Acknowledge alarm (displayed only when alarm is generated).
Magnify/reduce	Zoom in/out the trend display (from the same magnification to 1/60).

8.6 Data screen

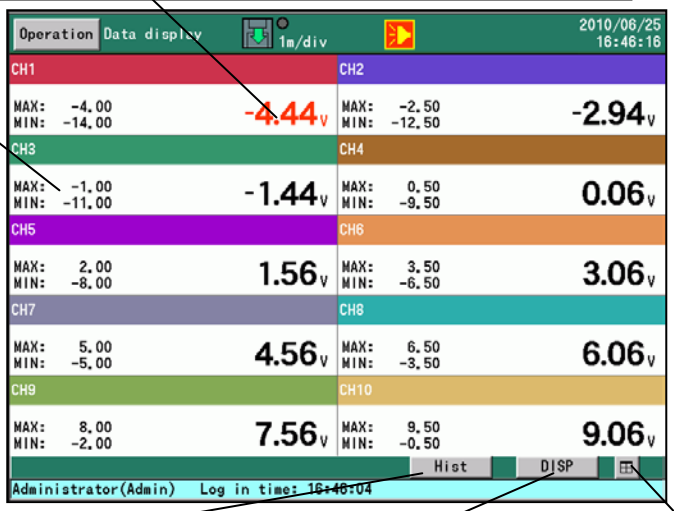
- This screen displays the measured data of each channel.
- The number of display data is decided by the preset number of display frames or registered channels.
  (Number of display frames: 1, 2, 3, 4, 6, 8, 9, 10, 12, 24, 36, 48, 56)

[Display style]

- Tap the [DISP] button and select “Data display” from the menu.

The measured data of the channel in alarm activated is displayed in red.

When the number of displayed channels is less than 12, maximum and minimum values of these channels can be displayed.
The values are reset at the record start. Non-display of these values is available.
(refer to “10.4.4 Common parameters”)



Historical trend display

Menu display

Switch to the 4-screen display

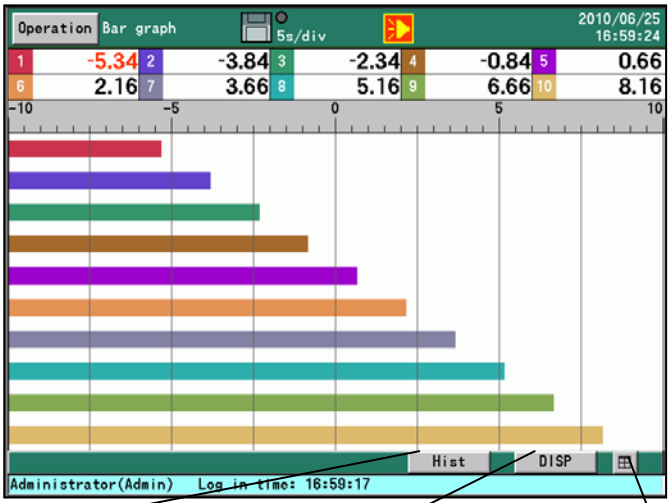
8.7 Bar graph screen

- The measured values of the channels are displayed with the bar graphs in real time and can be seen visually.
- The length of the bars and scale plates is displayed in the contents of the display scale with the smallest channel number in the group.

[Display style]

- Tap the [DISP] button and select “Bar graph” from the menu.

Selectable from data display (with or without tag) and no display.



Historical trend display

Menu display

Switch to the 4-screen display

8.8 Alarm display screen

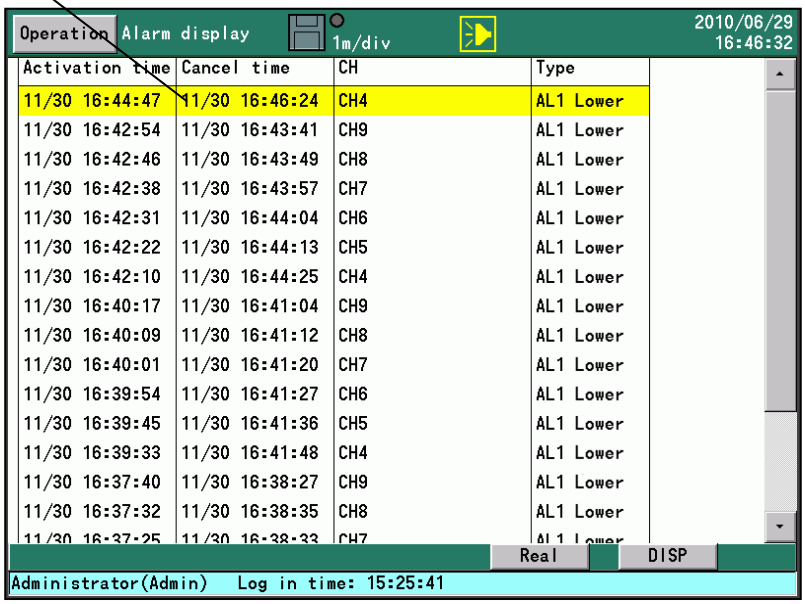
- The alarms being activated are displayed as a list.
- Activation date/time, cancel date/time (cancelled alarms only), channels (tag names). Alarm types are displayed in the reverse chronological order (latest on the top).
- Maximum 1000 alarm data are recorded. When the alarm data exceeds 1000, the data are deleted in chronological order.

[Display style]

- Tap the [DISP] button and select “Alarm display” from the menu.

Touching a line in the list jumps to the trend data of the selected alarm activation date. However, if no data is recorded for the day or no file is found, the trend data cannot be displayed.

The selected row is displayed in yellow.



8.9 Recorded data screen

- Files stored in the internal memory are listed in this screen. A start date, stop date and the number of data are displayed in reverse chronological order of files (most recent file comes first).
- Up to 3000 files can be displayed

Remarks For the case the number of files exceeds the display limit

If the number of files exceeds 3000, files are randomly displayed when the internal memory is refreshed (setting change or power ON/OFF).

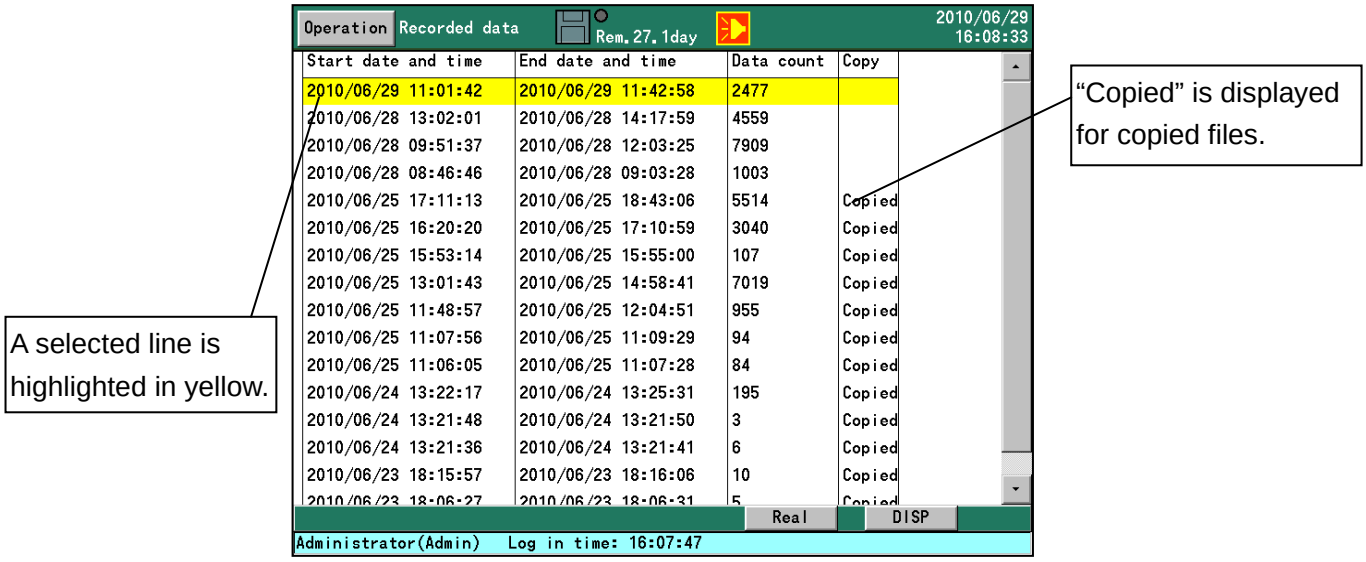
To avoid this, be careful not to let the number of files exceed 3000.

※Recorded data remains in the internal memory even the number of files exceeds 3000.

※The time required for copying to USB memory becomes longer as the number of files increases. To reduce the time for copying, keep the number of files small by deleting copied files regularly.

[Display style]

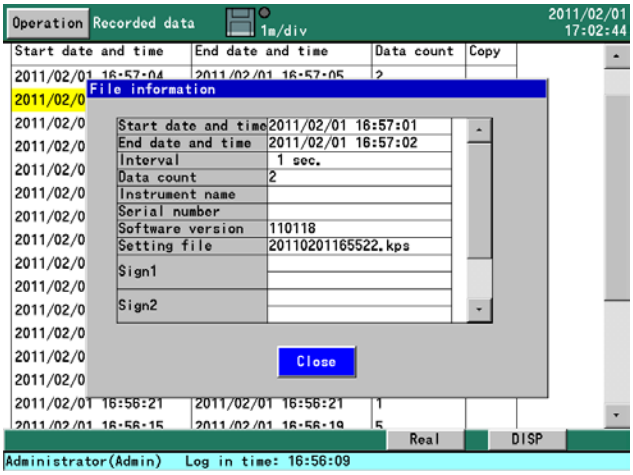
- Tap the [DISP] button and select “Recorded data” from the menu.
- “Copied” is displayed for copied files.



Pressing the ENTER key displays the following menu.

Menu item	Operation
Trend display	Display the trend of the selected file.
Delete	Delete the selected file. You cannot delete files which have not been copied.
FTP transmission	Transfer the selected file with FTP. When this is performed, “Copied” is displayed in the Copy column as in the case of file copy. ※To transfer a file with FTP, you need to set a FTP client. Refer to “10.11.3 FTP client settings”.
Delete all copied filess	Delete all copied files.
Copying to the USB memory	Copy the selected data to USB memory (displayed only when USB memory is connected).
File information	Display file information.

(File information)



File information item	Description
Start date and time	Recording start date and time
End date and time	Recording end date and time
Interval	Recording interval
Data count	Number of recorded data
Instrument name	Name of this instrument
Serial number	Serial number of this instrument
Software version	ROM version
Setting file	Setting file name at recording
Sign1 – Sign4	User who signed a file and signed date

Save conditions of recorded data

When any of the following conditions is met, recorded data is stored in the internal memory.

1. When the recording is stopped by a deviation from the recording conditions, pressing the STOP key or turning OFF the power.
2. At preset save intervals
3. When the amount of data reaches the capacity limit of a file.
   Maximum capacity of a file: 3904 Kbytes

(Calculating the maximum number of recordings to a single file)

The maximum number of recordings to a single file varies depending on the data amount and number of channels. It can be calculated using the following formula.

Maximum number of recordings = 3904 K (maximum capacity of file) / (data amount x number of channels)
(Data amount is normally 4 bytes but it becomes 6 bytes when the data format is set to “Highest/lowest”. 1 Kbyte = 1024 bytes)

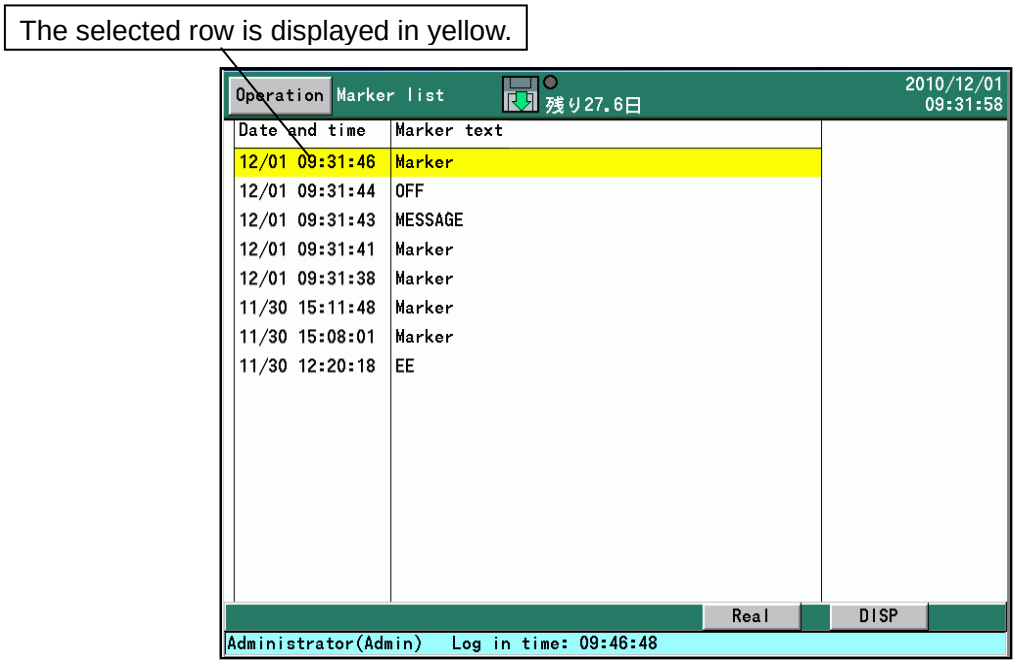
(Example) Using 12 channels (4-byte data): 83280 times of recording

8.10 Marker list screen

- The list of markers recorded on the trends is displayed. The date and time and the marker text are displayed in the reverse chronological order (latest on the top).
- Maximum 200 markers are recorded. When the recorded marker exceeds 200, the markers are deleted in chronological order.

[Display style]

- Tap the [DISP] button and select “Marker list” from the menu.



Touching a line in the list displays the following menu.

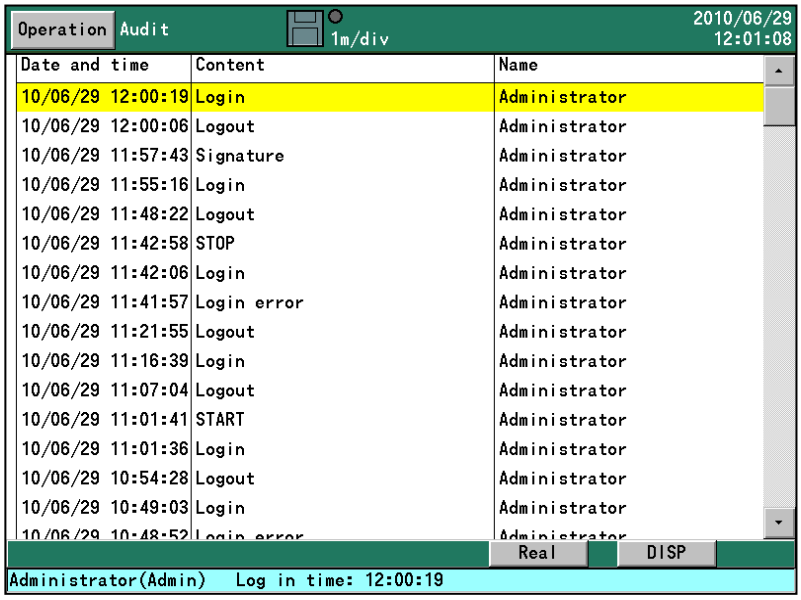
Menu item	Operation
Trend display	The screen is jumped to the trend position of the marker of the selected row. When the file is not found, the screen cannot be jumped.
Delete	The marker of the selected row is deleted.
Delete all	All markers in the list are deleted.

8.11 Audit screen

- Audit trails are listed in this screen. Audit trails are displayed in reverse chronological order (most recent data comes first).
- The maximum number of data is 2000. If it s exceeded, the data is deleted from the oldest.

[Display style]

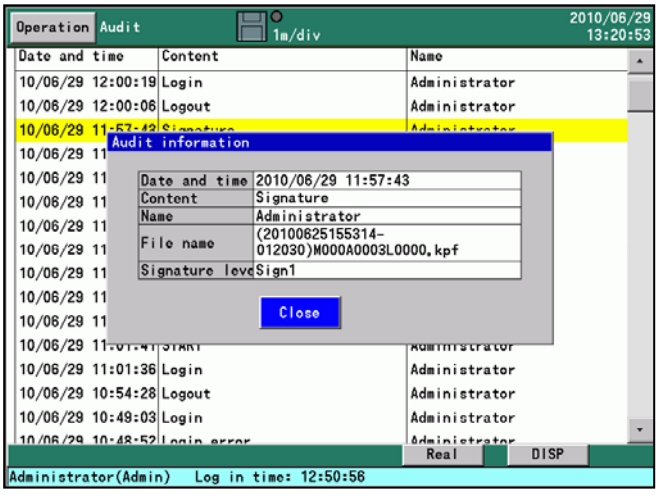
- Tap the [DISP] button and select “Audit” from the menu.



Touching a line in the list displays the following menu.

Menu item	Operation
Audit information	Display a date, content and user name regarding operations and changes made. Display a setting file name only when a change is made in the file.

(Audit information)



Audit information item	Description
Date and time	Date and time at which operation/change is executed
Content	Operation/change content
Name	User name who executes operation/change
Setting file*1	Name of a changed setting file
Sign level*2	Level of signature
Changes*3	Channel and number of changed alarm setting
Changed from*3*4	Set value before the change
Changed to*3*4	Set value after the change

*1 Displayed when a setting change is made.

*2 Displayed when a signature is used.

*3 Displayed when alarm setting is changed by a general user.

*4 Displayed when recording interval is changed by a general user.

List of audit trails ※General user must have the authority to be set.

Available user	Display items	Description
—	Power ON	Recorded at power on.
—	Power OFF	Recorded at power off.
Administrator/general	Login	Recorded at manual login.
Administrator/general	Login (Com)	Recorded at login with high order communication.
Administrator/general	Logout	Recorded at manual logout.
Administrator/general	Logout (Com)	Recorded at logout with high order communication.
Administrator/general	START	Recorded at recording start.
Administrator/general	STOP	Recorded at recording stop.
Administrator/general	Change date	Recorded when time is changed manually.
Administrator/general	Password setting	Recorded when password is changed.
Administrator/general	Sign	Recorded when signature is used.
Administrator/general	Scale adjustment	Recorded when scale is adjusted.
Administrator/general	Alarm ACK	Recorded when alarm ACK is executed.
Administrator/general	Write marker	Recorded when marker is written manually.
Administrator/general	File copy (to USB)	Recorded when setting file/recorded data is copied to USB memory.
Administrator/general	File copy (from USB)	Recorded when setting file is copied to the internal memory from USB memory.
Administrator/general	Snap shot	Recorded at snapshot save.
Administrator/general	FTP transmission	Recorded when recorded data transfer with FTP is completed.
Administrator/general	Delete file	Recorded when copied file is deleted from the recorded data/ setting history screens.
Administrator/general	Delete marker	Recorded when marker is deleted from the marker list.
Administrator	Change settings (Admin)	Recorded when administrator user changes and saves a setting.
Administrator	Set [Input operation]	Recorded when [Input operation settings] is changed.
Administrator	Set [Range type]	Recorded when range type of CH is changed.
Administrator	Set [Range min.]	Recorded when range lower limit of CH is changed.
Administrator	Set [Range max.]	Recorded when range upper limit of CH is changed.
Administrator	Set [Scale min.]	Recorded when scale lower limit of CH is changed.
Administrator	Set [Scale max.]	Recorded when scale upper limit of CH is changed.
Administrator	Set [Correction]	Recorded when sensor correction of CH is changed.
Administrator	Set [RJ]	Recorded when RJ of CH is changed.
Administrator	Set [Burn out]	Recorded when burn out of CH is changed.
Administrator	Set [Filter level]	Recorded when filter level of CH is changed.
Administrator	Set [Tag]	Recorded when tag of CH is changed.
Administrator	Set [Unit]	Recorded when unit of CH is changed.
Administrator	Set [Calculate]	Recorded when calculation usage of CH is changed.
Administrator	Set [Formula]	Recorded when formula of CH is changed.
Administrator/general	Set [Display]	Recorded when [Display settings] is changed.
Administrator	Set [Alarm settings]	Recorded when [Alarm settings] is changed.
Administrator	Set [Alarm:Type]	Recorded when alarm type is changed.
Administrator/general	Set [Alarm:Value]	Recorded when alarm setting value is changed.
Administrator	Set [Alarm:Ref. CH]	Recorded when alarm reference CH is changed.
Administrator	Set [Alarm:Deadband]	Recorded when alarm dead band is changed.
Administrator	Set [Alarm:Delay]	Recorded when alarm delay is changed.
Administrator	Set [Alarm:Relay]	Recorded when alarm relay is changed.
Administrator	Set [Alarm:AND/OR]	Recorded when alarm AND/OR is changed.
Administrator	Set [Alarm:Marker]	Recorded when alarm marker is changed.
Administrator	Set [File]	Recorded when [File settings] is changed.
Administrator	Set [Recording cycle]	Recorded when [Recording cycle] is changed.
Administrator	Set [Totalizer reset]	Recorded when [Totalizer reset settings] is changed.
Administrator	Set [Schedule]	Recorded when [Schedule settings] is changed.
Administrator	Set [Marker]	Recorded when [Marker text settings] is changed.

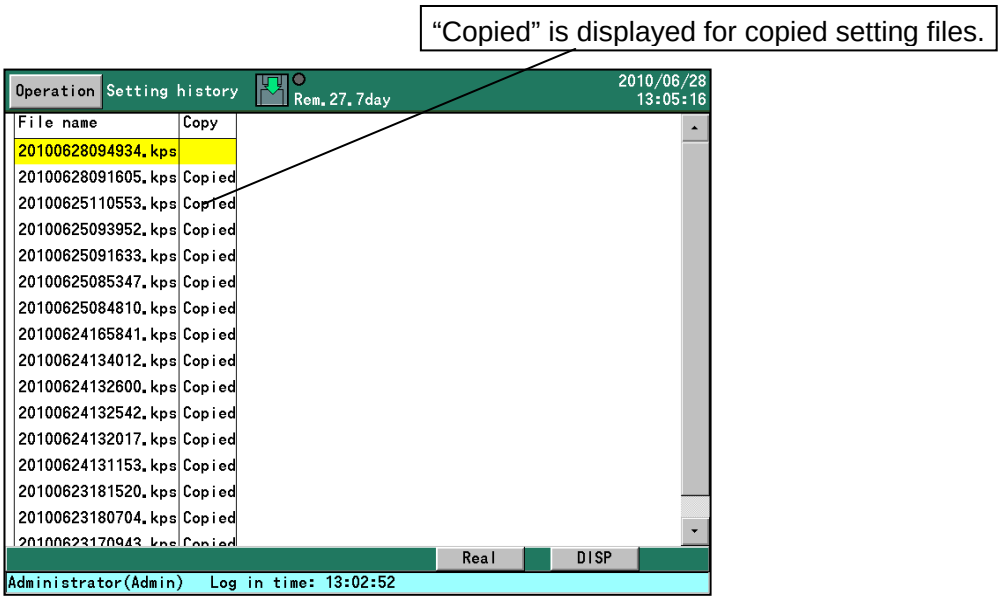
Administrator	Set [Network]	Recorded when [Network settings] is changed.
Administrator	Set [System]	Recorded when [System settings] is changed.
Administrator	Set [low order communication]	Recorded when low order communications settings are changed.
Administrator	Initialize settings	Recorded at initialization of settings.
Administrator	SNTP	Recorded when time synchronization is executed manually with SNTP.
Administrator	Totalizer reset	Recorded when totalizer reset is executed manually.
Administrator	Maker settings	Recorded when change is made in the maker settings.
General	Display setting	Recorded when general user changes and saves a display setting.
General	Alarm setting	Recorded when general user changes and saves an alarm set value.
General	Set recording cycle	Recorded when general user changes and saves the recording interval.
Administrator/general	Memory capacity error	Recorded at shortage of the internal memory.
Administrator/general	Write setting error	Recorded when history file cannot be saved in the internal memory at setting change.
Administrator/general	Recording error	Recorded when writing to or reading from the internal memory fails.
Administrator/general	Memory error	Recorded when writing to buffer memory fails.
Administrator/general	Input board err	Recorded when the built-in input board failure occurs.
Administrator/general	Marker error	Recorded when saving to the internal memory fails at marker writing.
Administrator/general	Login error	Recorded when invalid ID or password is entered at login.
Administrator/general	Locked out	Recorded when the number of failed logins exceeds the limit.
Administrator/general	Low order com err	Recorded when communication with low order devices is not established.
Administrator	Settings writing (Communications)	Recorded when settings are changed by upper order communications.
Administrator	Settings saving (Communications)	Recorded when settings contents changed by upper order communications is saved.

8.12 Setting history screen

- Histories of setting files are listed in reverse chronological order (most recent file comes first). This is created when a setting change is made.
- “Copied” is displayed for copied setting files. Files are named with their creation date.

[Display style]

- Tap the [DISP] button and select “Setting history” from the menu.



Touching a line in the list displays the following menu.

Menu item	Operation
Delete	Delete the selected file. ※Copied file only
Delete all copied filess	Delete all copied files.

8.13 Operation method of 4-screen split display

This instrument provides a 4-screen split display to allow users to view 4 different screens at the same time.
With this 4-screen display, the selectable display types are limited to the real time trend, data display and bar graph.

<Switching from a single screen display to 4-screen display>

- Tap the [DISP] button and select “4 screens” from the menu.
- Tap the ic located in the lower right of the screen.

Executing any of the above switches the display to the 4-screen display.

<Switching from a 4-screen display to single screen display>

- Touch any part within the frame you want to enlarge.
- Tap the [DISP] button of the target frame and select “1 screen” from the menu.
- Press the DISP key to enter the frame selection mode (*). After that, select the frame you want to enlarge using the direction key and press the ENTER key.

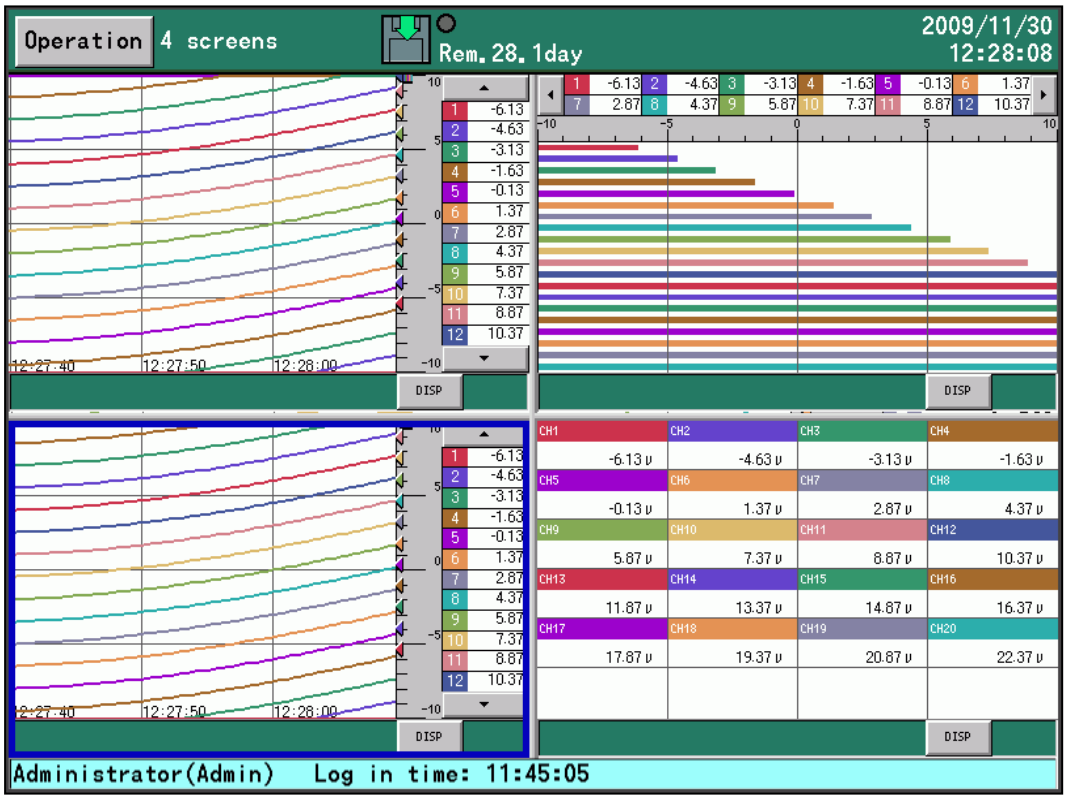
Executing any of the above switches the display to the single screen display.

(*Frame selection mode)

- Pressing the DISP key on a 4-screen display enters the frame selection mode. In this mode, use the direction key to select a frame, and the following key operations are available.

Key	Operation
ENTER	Display the selected frame with a single screen display.
DISP	Display the DISP menu for the selected frame. An item selected from the DISP menu is effective for the selected frame.
ESC	Exit the frame selection mode.

- The selected screen is surrounded with a blue frame.



9 Operation of each function

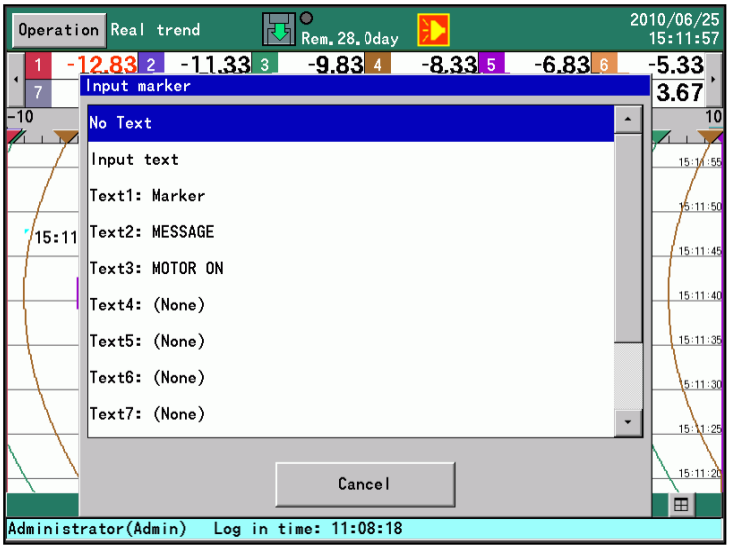
9.1 Marker writing

You can write a marker text to a trend graph which is being recorded.
※It is not possible to write a marker text to a saved data file.

[How to write]

Tapping the [MARKER] button displays the input marker screen as shown below. When you touch a desired text, it will be written to the trend graph. The marker is written at the time the [MARKER] button is tapped.

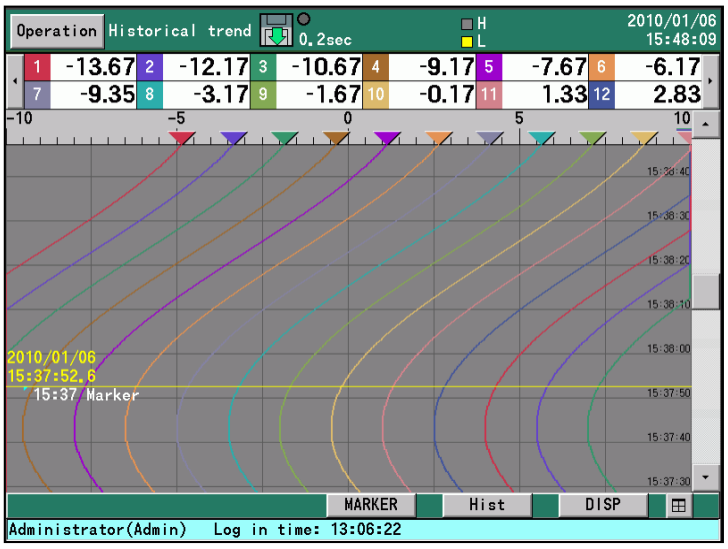
<Real time trend screen>



Item	Description
No text	Write only the time at which marker is written.
Input text	Write arbitrary entered characters.
Text1 - 50	Write a preset text (refer to “10.9 Marker text setting”).

You can write a marker to a historical trend which belongs to the file currently being recorded. In this case, a marker is written to a cursor position.

<Historical trend screen>



9.2 Digital signature

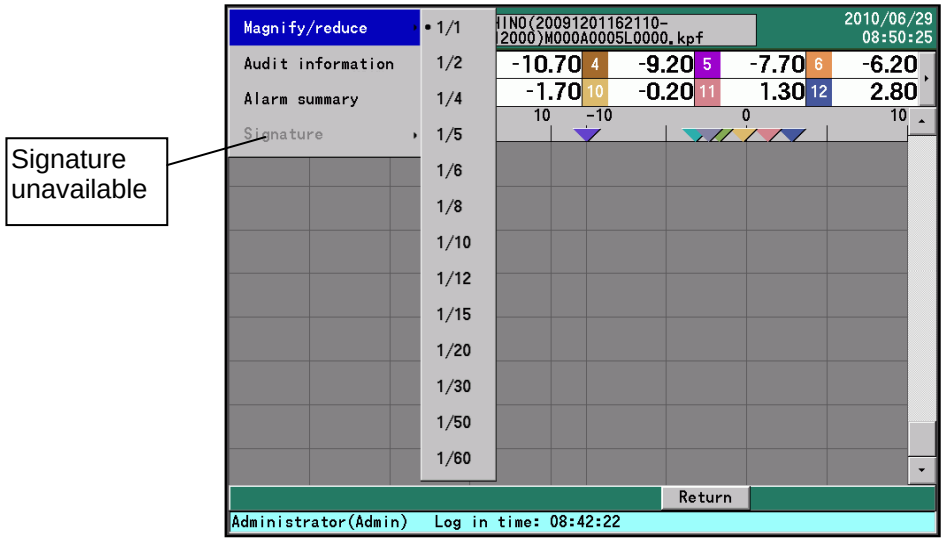
A digital signature can be placed on recorded data.

- Administrator user is allowed to use all levels of signature.
- General user can only use a specific level of signature registered by “User authority setting”.
- Signature must be placed in number order from level 1. For example, to place a signature of level 3, level 1 and level 2 signatures must be placed beforehand.
- You cannot cancel a signature placed.
- To select a signature, you need to scroll the trend data, [Audit information] and [Alarm summary] of the displayed data **down to the bottom**.

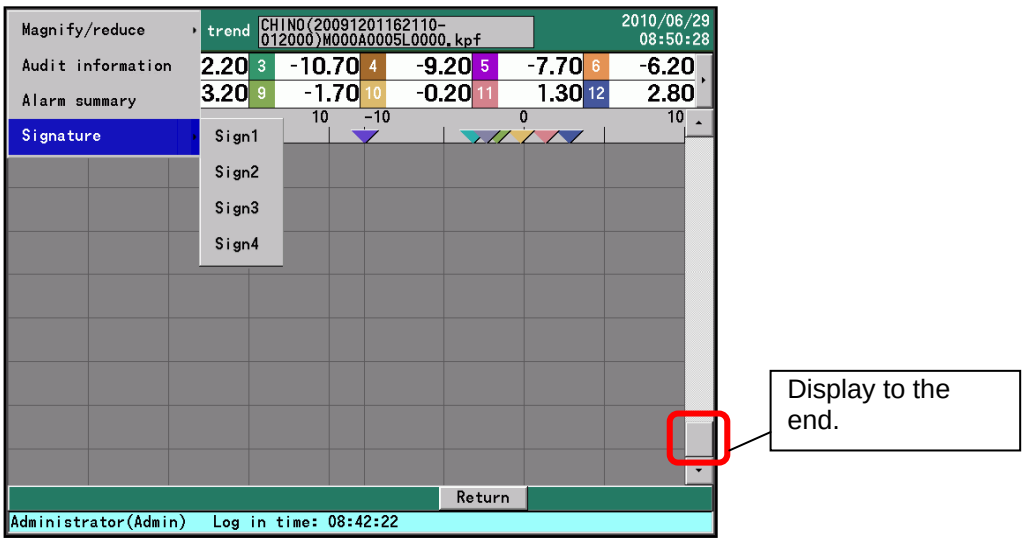
[How to sign]

① Display a recorded data you want to sign.
Tap the [DISP] button and select [Recorded data]. Touch the data you want to sign from the list and select [Trend display].
※Either a historical trend or dual trend will be displayed.

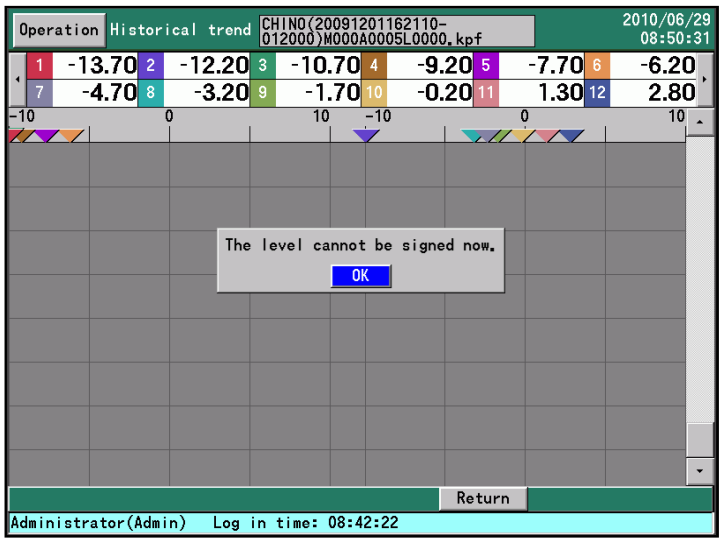
② Tapping the [Operation] button or pressing the ENTER key on the displayed trend screen will bring the following screen.
※You cannot place a signature yet.



③ Signature becomes selectable when you scroll the trend data, audit information and alarm summary of the displayed data **down to the bottom**.
※You cannot cancel a signature.



※Signature must be placed in number order from level 1. For example, to place a signature of level 3, level 1 and level 2 signatures must be placed beforehand. When you try to place a level 3 signature before level 1 and level 2 signatures, it will be rejected with the following warning message display.



9.3 Data copy to USB memory

- You can copy a recorded data file, setting file, or snapshot file stored in the internal memory to USB memory (up to 8 Gbytes) by connecting it to the USB port of this instrument. Also, you can copy a setting file stored in USB memory to the internal memory.
- There are three ways to copy the data to USB memory: (1) Copying from the menu screen, (2) Copying from the operation screen, and (3) Copying from the recorded data screen.

※Not all USB memory operations are guaranteed.
※Do not use external media such as hard disk, ZIP, MO and optical disk. Connecting any of these to the instrument may damage the connected medium.

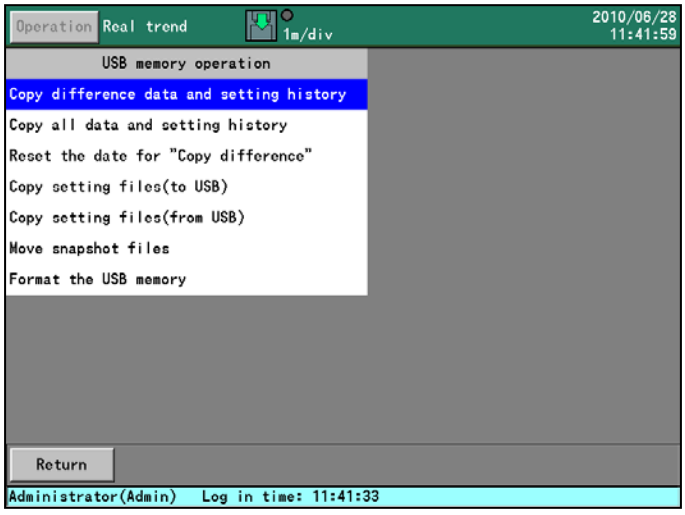
Remarks Time required for copying

A longer time may be required for copying depending on the data amount (it may take some hours in some cases).
Example:
When you copy the data obtained from one-month operation with 12 channels, recording cycle set to 1 min and file size set to 24 hours to USB memory, it takes approx. 30 seconds to complete it.
※To reduce the time for copying, keep the number of files small by deleting copied files regularly.

①Copying from the menu screen

On the setting menu screen, tap [Memory operation] - [USB memory operation] to display the following screen.

<USB memory operation screen>



When you select an operation from the menu, the message “Insert USB memory” will be displayed. The selected operation will be started when you insert USB memory to the instrument. When copying is completed, the message “Copied” appears. Tap the [OK] button and disconnect USB memory.

※Do not disconnect USB memory before the message instructing to do so is displayed. It may cause data corruption.

When you select [Copy all data and setting history], [Copy setting files (to USB)] or [Copy setting files (from USB)], the message “Please select the copy action” will be displayed.

- Overwrite: If a file of the same name exists in a destination space, the file will be overwritten.
- Skip: If a file of the same name exists in a destination space, the file will be skipped without copying.
- Cancel: Copy is cancelled.

[USB memory operations]

Operation menu	Description
Copy difference data and setting history	Copy the recorded data obtained from the last copied time (reference time) to USB memory.
Copy all data and setting history	Copy all recorded data to USB memory. Select overwrite or skip.
Reset the date for “Copy difference”	Set the reference time for copying to the current time. ※This should be executed while the lamp indicating access to the internal memory is off (disk access lamp is off).
Copy setting files (to USB)	Copy a setting file to USB memory. Select overwrite or skip.
Copy setting files (from USB)	Copy a setting file from USB memory. Select overwrite or skip.
Move snapshot files	Move all snapshot files stored in this instrument to USB memory. When this is executed, snapshots are removed from the instrument.
Format the USB memory	Execute a quick format of USB memory.

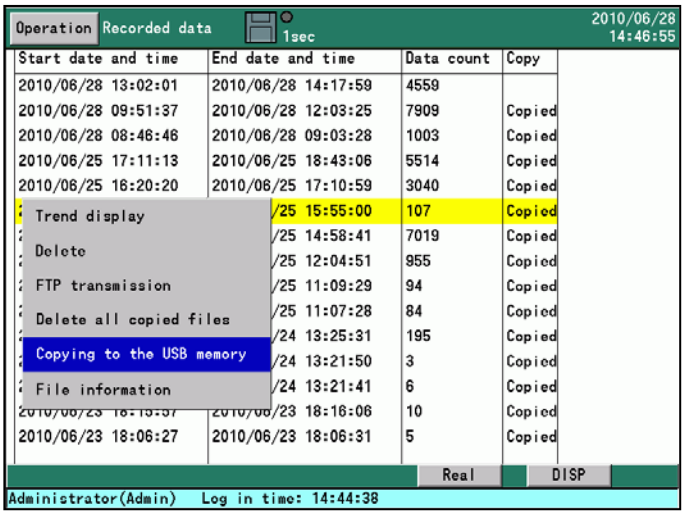
②Copying from the operation screen

When USB memory is connected to the instrument while the operation screen is displayed, the recorded data obtained from the last copied time will be copied to USB memory automatically. Connection to the USB memory will be terminated when the copy is finished (same as “Copy difference data and setting history” described in (1) Copying from the menu screen in the previous page).
※Do not disconnect USB memory before the message instructing to do so is displayed. It may cause data corruption.

③Copying from Recorded data screen

When you open Recorded data screen and touch the files listed while USB memory is connected, the following screen is displayed. Tapping the shown menu item "Copying to the USB memory" copies the file to the USB memory.

＜Recorded data screen (at file touch)＞



⚠ Warning

■Never turn off the power during data accessing.
If the power is turned off while a data file is being accessed, the data stored in the internal memory or USB memory may be destroyed and lost.

■Do not disconnect USB memory during data accessing.
If USB memory is disconnected from the instrument while a data file is being accessed, the data stored in the internal memory or USB memory may be destroyed and lost.

■Make sure to disconnect USB memory after the message “Pull out USB memory” is displayed.

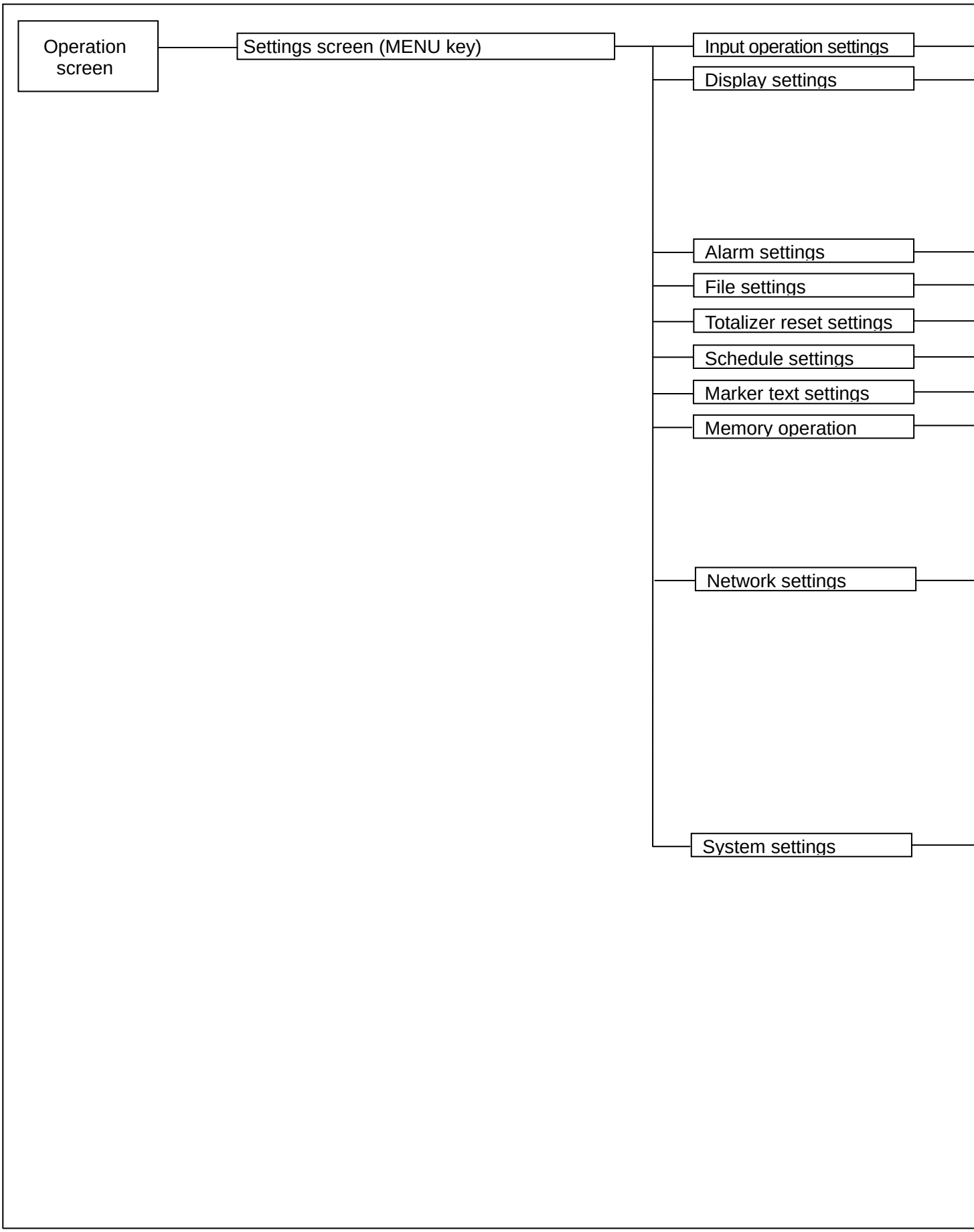
■Use USB memory under appropriate operating temperatures.
Connect USB memory observing its operating temperature range. You may fail to write to USB memory in an environment out of the appropriate temperature range.

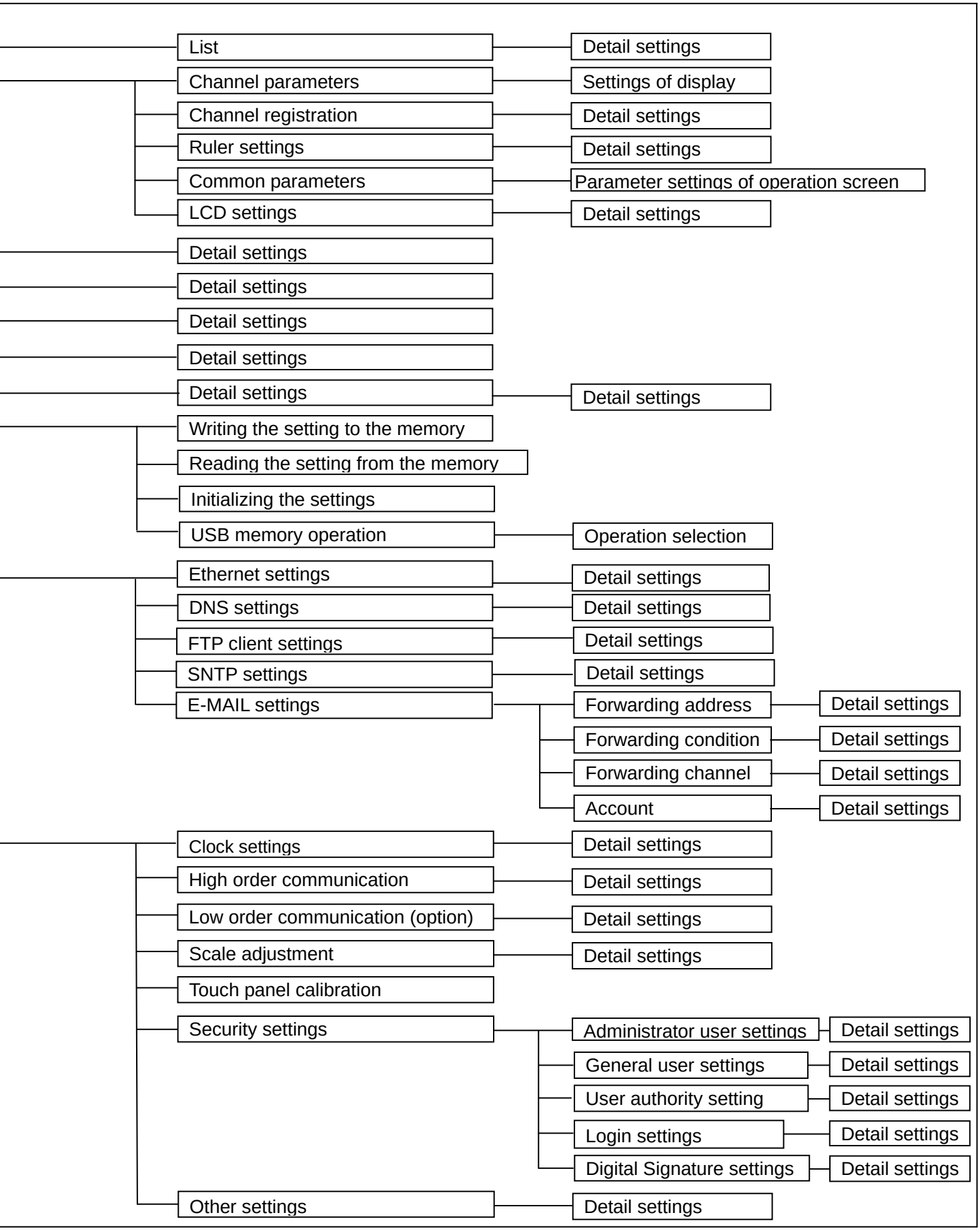
■Avoid using USB memory in noisy environment
Writing to USB memory should be performed in a noise-free environment to avoid failure. You may fail to write to USB memory in a noisy environment.

MEMO

10 Various Settings

10.1 Settings flow chart



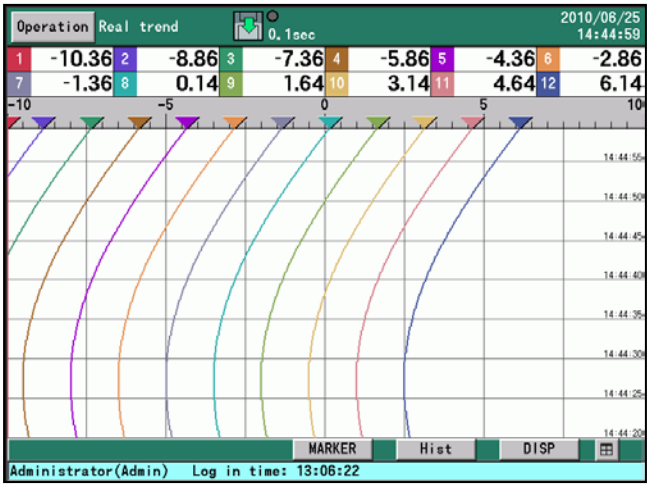

List
Detail settings
Channel parameters
Settings of display
Channel registration
Detail settings
Ruler settings
Detail settings
Common parameters
Parameter settings of operation screen
LCD settings
Detail settings
Detail settings
Detail settings
Detail settings
Detail settings
Detail settings
Writing the setting to the memory
Reading the setting from the memory
Initializing the settings
USB memory operation
Operation selection
Ethernet settings
Detail settings
DNS settings
Detail settings
FTP client settings
Detail settings
SNTP settings
Detail settings
E-MAIL settings
Forwarding address
Detail settings
Forwarding condition
Detail settings
Forwarding channel
Detail settings
Account
Detail settings
Clock settings
Detail settings
High order communication
Detail settings
Low order communication (option)
Detail settings
Scale adjustment
Detail settings
Touch panel calibration
Security settings
Administrator user settings
Detail settings
General user settings
Detail settings
User authority setting
Detail settings
Login settings
Detail settings
Digital Signature settings
Detail settings
Other settings
Detail settings

10.2 Setting Menu Items

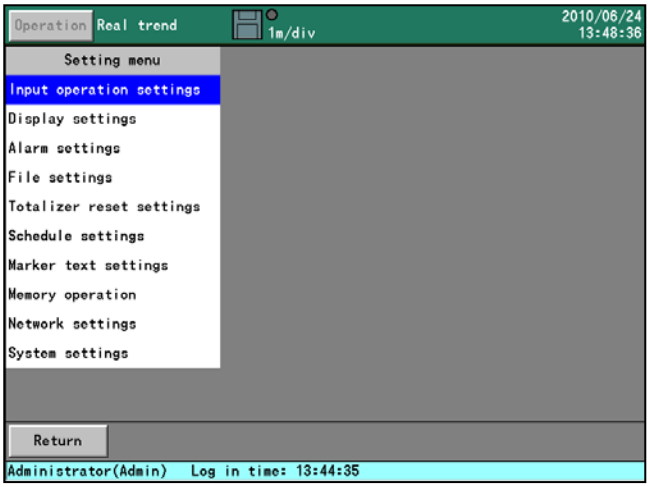
On the operation screen, tap the [Operation] button and select [MENU settings] to display the setting menu screen.

※Setting menu differs between administrator user and general user. Also, general user's setting menu items vary depending on the authority level of the user (refer to "10.12.3 Security settings").

<Operation screen>

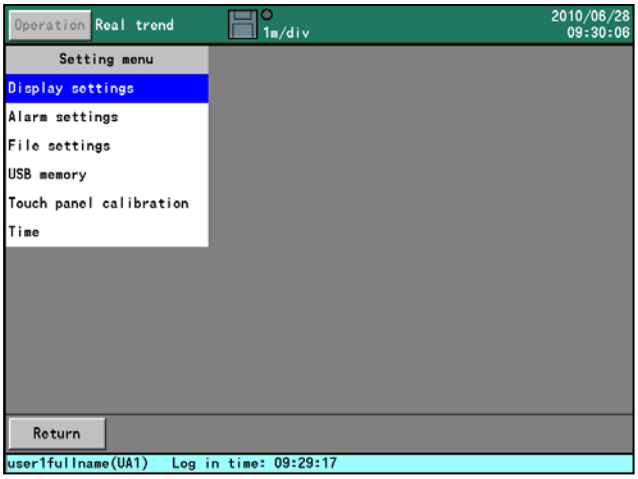


<Setting menu screen (Administrator user)>



All items of the setting menu are displayed for administrator user.

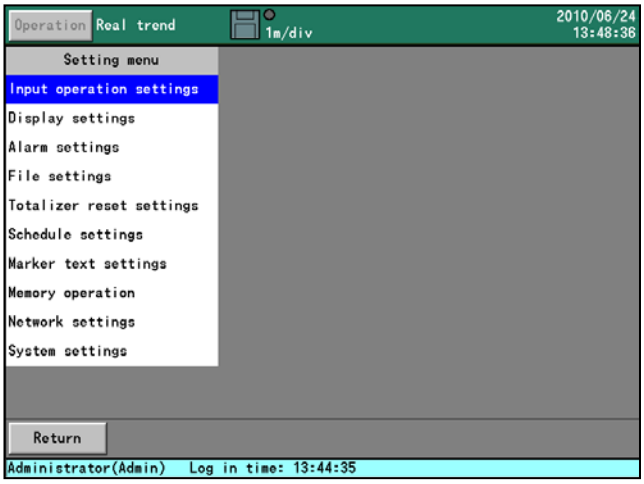
<Setting menu screen (General user)>



General user's setting menu items vary depending on the user authority level.

※When the auto logout time is reached during settings, the real time trend will be displayed automatically without reflecting the settings you made.

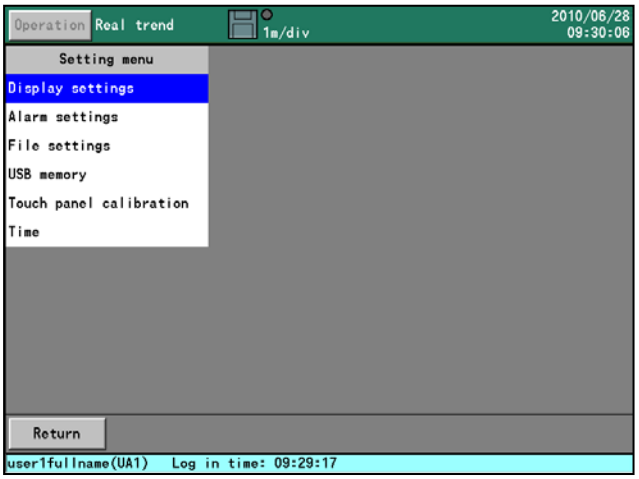
<Setting menu screen (Administrator user)>



List of setting menu items (administrator user)

Input operation settings	Refer to “10.3 Input operation settings”.
Display settings	Refer to “10.4 Display settings”.
Alarm settings	Refer to “10.5 Alarm settings”.
File settings	Refer to “10.6 File settings”.
Totalizer reset settings	Refer to “10.7 Totalizer reset settings”.
Schedule settings	Refer to “10.8 Schedule settings”.
Marker text settings	Refer to “10.9 Marker text settings”.
Memory operation	Refer to “10.10 Memory operation”.
Network settings	Refer to “10.11 Network settings”.
System settings	Refer to “10.12 System settings”.

<Setting menu screen (general user)>



※Menu items vary depending on the user authority level.

Setting menu items (General user)

Display settings	Refer to “10.4 Display settings”.
Alarm settings	Refer to “10.5 Alarm settings”.
File settings	Refer to “10.6 File settings”.
USB memory	Refer to “10.10 Memory operation”.
Touch panel calibration	Refer to “10.12.4 Touch panel calibration”.
Time	Refer to “10.12.1 Clock settings”.

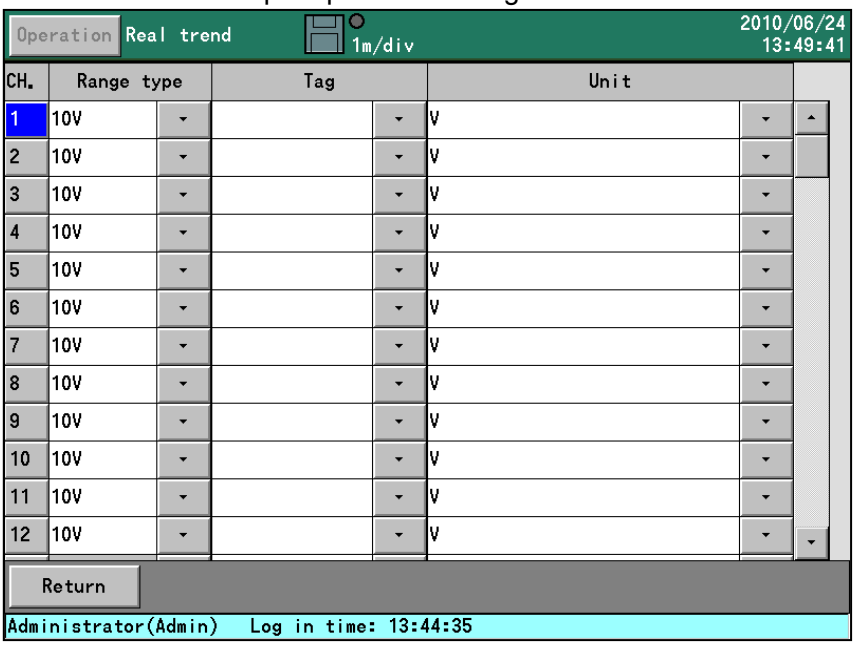
※General user can change only some parts of the alarm and file settings.

10.3 Input operation settings

10.3.1 Setting contents

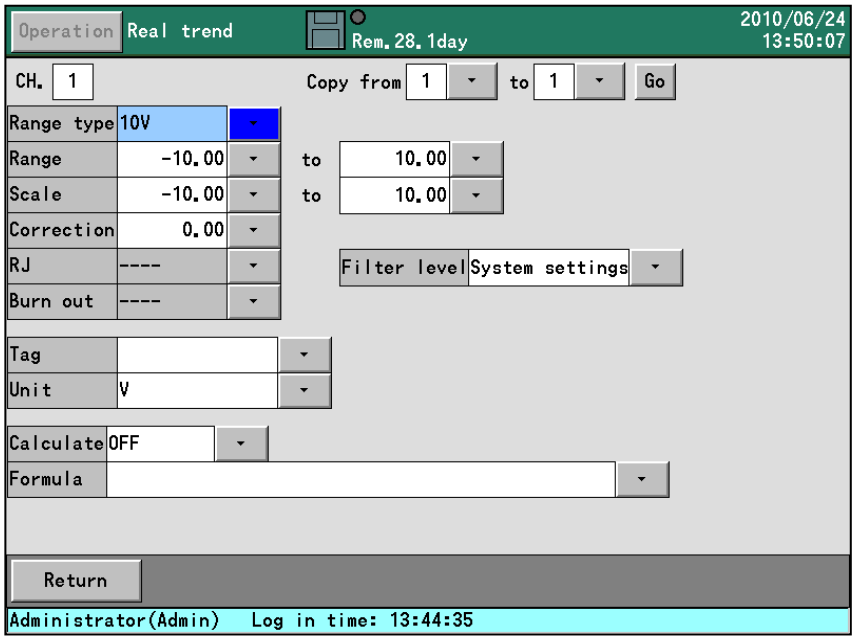
- Tap [Input operation settings] in the setting menu to display the following screen.
- On this screen, you can set the channel-related items such as range and tag for each channel.

<Input operation settings screen>



*When Low order communication(read) option is effective, the item for the low order communication registration is added. Please see "11.1 Low order communication(read)" also.

- By touching a CH number, the detailed setting screen for this channel is displayed.
- Tapping the ▼ button beside the item you want to set brings the entry screen.



■Setting the range type

(Analog input) KR3P20,KR3P21: CH1 to 12, KR3P40,KR3P41: CH1 to 24
KR3P60,KR3P61: CH1 to 36, KR3P80,KR3P81: CH1 to 48

DC voltage	13.8mV, 27.6mV, 69mV, 200mV, 500mV, 2V, 5V, 10V, 20V, 50V
Thermocouple	K, E, J, T, R, S, B, N, W-WRe26, WRe5-WRe26, PR40-20, NiMo-Ni, CR-AuFe, Platinel2, U, L
Resistance thermometer	Pt100, JPt100, Pt50,Pt—Co

(Digital input) ∗For the optional digital input specified CH121 to 128

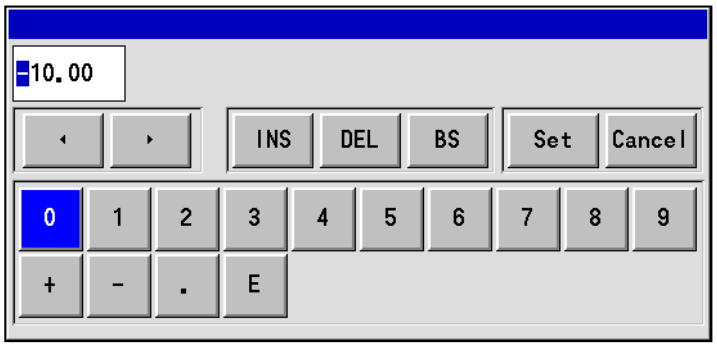
Digital input	DI
Pulse input	Pulse(+), Pulse(-)

■Setting the range

- Set the range. (It is decided by the range type.)

■Setting the scale

- Set the scale. (It is decided by the range type.)



Since the number of digits after decimal point set here becomes the number of digits after decimal point for the measured value, enter a value correctly.

■Setting the sensor correction

- Set a value (shift value) added to the input value.

■Setting the RJ (Reference junction compensation)

- Set whether the RJ is internal or external.

■Setting the burn out

None	The burnout function is not used.
UP	Set to the upscale burnout.
DOWN	Set to the downscale burnout.

■Setting the filter level

- The input filter level can be set from 0 to 3. 0 means no-filter, and 3 means the strongest filter. When [system settings] is selected, settings are following [system settings] – [other settings].

■Setting the tag

・ Setting a tag name (Setting for displaying the tag name instead of the channel number)
When the display of the data of a [Display settings]-[Common parameters] is set with tag, it is effective.

■Setting the unit

・ Set the engineering unit of its channel.

■Setting the usage of calculation

OFF	The input data are displayed and recorded as the measured date of its channel.
ON	The results processed by the calculation formula are displayed and recorded as the measured data of its channel.

■Setting the formula

・ When the calculation usage is ON, set the formula of its channel.

■Copying the parameters with the copy function

・ The above shows the setting for copying Channel 01 from Channel 02 to Channel 05. By tapping the [Go], the parameters of Channel 01 are copied from Channel 02 to Channel 05.

10.3.2 Setting method of formula

1) Formula types

• Mathematical calculation

Four arithmetic operations are performed.

	Symbol	Example	Remarks
Addition	+	*X* **+***Y*	
Subtraction	-	*X* **-***Y*	
Multiplication	*	*X* ***Y*	
Division	/	*X***/***Y*	
Reminder	%	*X* **%***Y*	
Exponential	^	*X* **^***Y*	

※ *X* and *Y* indicate the formula or the numeric value.

• Comparison calculation

The comparison calculation is performed and the result is;
1 (established) or
0 (not established)

	Symbol	Example	Remarks
Equal value	==	*X* **==***Y*	
Unequal value	!=	*X* **!=***Y*	
More than	>>	*X* **>>***Y*	
Less than	<<	*X* **<<***Y*	
Equal or more than	>=	*X* **>=***Y*	
Equal or less than	<=	*X* **<=***Y*	

※ *X* and *Y* indicate the formula or the numeric value.

• Logic operation

The logic operation for 1 or 0 is performed and the result is returned as 1 or 0.

	Symbol	Example	Remarks
Logical AND	AND	*X* **AND***Y*	
Logical OR	OR	*X* **OR***Y*	
Exclusive OR	XOR	*X* **XOR***Y*	
Negation	NOT	**NOT(***X* **)**	Put the object being negative in brackets.

※ *X* and *Y* indicate the formula or the numeric value.

※ Express *X* and *Y* as *0* or *1.*

• General calculation functions

The function calculation is performed.

	Symbol	Example	Remarks
Round up after the decimal	CEL	**CEL(***X* **)**	
Round down after the decimal	FLR	**FLR(***X* **)**	
Absolute value	ABS	**ABS(***X* **)**	
Square root	SQR	**SQR(***X* **)**	
Power of e	EXP	**EXP(***X* **)**	
Natural logarithm (The base is e.)	LOG	**LOG(***X* **)**	
Common logarithm (The base is 10.)	LOG10	**LOG10(***X* **)**	

※ *X* indicates the formula or the numeric value.

• Channel data calculation functions

The function calculation is performed.
When an error data (OVER, UNDER, etc.) is included in the measured data, it becomes “CAL ER”.

	Symbol	Example	Remarks
Measured data	CH	**CH(***X***)**	X is channel No.
Calculation result data	PCH	**PCH(***X* **)**	
Previous calculated result data	OCH	**OCH(***X* **)**	Data at the previous scanning (before 0.1 seconds)
Totalizer	ITG	**ITG(***X* **)**	Refer to 2) Totalizing operation
24-hour totalizing	ITG24	**ITG24(***X* **)**	Refer to 2) Totalizing operation
F value	FV	**FV(***X#To#Z#R* **)**	Refer to 3) F value
Relative humidity	RH	**RH(***D#W* **)**	Refer to 4) Relative humidity
Dew-point temperature	DEW	**DEW(***T#H* **)**	Refer to 5) Dew-point temperature
Moving average (an hour)	AVE	**AVE(***X#T* **)**	Refer to 6) Moving average
Moving average (5 minutes)	AVEH	**AVEH(***X#T* **)**	Refer to 6) Moving average
Past data (an hour)	OLD	**OLD**(*X#T*)	Refer to 7) Past data
Past data (5 minutes)	OLDH	**OLDH**(*X#T*)	Refer to 7) Past data
First-order leg filter	IIR	**IIR**(*X#T*)	Refer to 8) First- order filter
Increment per time	PLS	**PLS**(*X#T*)	Refer to 9) Increment per time

※ *X* indicates the channel number.

※When the channel data calculation is specified for executing with the settings of the designated channel number, the calculated results of the designated channel number are used. In addition, when the designated channel number is greater than the channel number for calculation, the calculation results obtained previously at the designated channel are used.

• System information acquisition function

	Symbol	Example	Remarks
Remaining internal memory	CF	**CF**(*A*)	A = unit of the memory 0: MB 1: Minute 2: Hour 3: Day
System error detection※	KRERR	**KRERR**()	System error detection 0: Normal 1: Error occurred
User lock-out detection	LOUT	**LOUT**()	User lock-out detection 0: Normal 1: Locked out

※ System error: Data storage memory error (CP capacity error, malfunction, etc), temporary storage memory error, input board malfunction

・Other function

	Symbol	Example	Remarks
Wind display	AZI	**AZI**(*A*)	Refer to 10) Wind display

2) Totalizing operation

For the totalizer, the ITG function or the ITG24 function is used.
Do not use the totalizing function more than two times in one formula. The results are not calculated correctly. The totalizing function can be used in calculations other than the totalizer.
Example: ITG(1)+ITG(2), ITG24(1)-ITG(1), ITG(1)/100
For the totalizer rest, refer to “10.7 Totalizer reset settings”.

(1) Standard totalizing operation

The totalized values are reset at the totalizer reset reference time or at every interval.
Entering method of the formula

ITG(d)

d: Channel number to be totalized

Calculation contents

$$D_n = D_{n-1}+[(PV_n + PV_{n-1})\times(T_n-T_{n-1})]\div 2$$

D_n: Totalized result — D_{n-1}: Previous totalized result
PV_n: Data to be totalized — PV_{n-1}: Data totalized at the previous calculation
T_n: Time of calculation — T_{n-1}: Time of the previous calculation (before 0.1 second)

When error data (OVER, UNDER, etc.) are included, the calculation is not performed and the previous results are used.

(2) 24-hour totalizing operation

The totalized values are reset only at the totalizer reset reference time or at every interval.

Entering method of the formula

ITG24(d)

d: Channel number to be totalized

The calculation contents are same as the standard totalizing operation.
※Totalizer is performed every 0.1 seconds regardless of measurement cycle (either KR3P*0 and KR3P*1).

3) F-value

Entering method of the formula

FV (X#To#Z#R)

X: Channel to be calculated, To: F-value calculation reference temperature, Z: Z-value,
R: F-value calculation starting temperature

The following formula is used for the F-value calculation.
$\int 10^{A} dt$ Provision: $A=(T-To)\div Z$ T: channel data to be calculated

When T exceeds R, the F-value is reset to 0.

4) Relative humidity

Entering method of the formula

RH (D#W)

D: Dry bulb temperature, W: Wet bulb temperature

The following formula is used for the relative humidity calculation.
((B-0.000662×1013.0×(D-W))÷A)×100
Provision: A; Dry bulb saturated water vapor pressure, B: Wet bulb saturated water vapor pressure

The following formula is used for the calculation of the saturated water vapor pressure.
6.1121×EXP((17.502×T)÷(240.9+T)) T: Temperature

5) Dew-point temperature

Entering method of the formula

DEW (T#H)

T: Temperature data channel, H: Relative humidity channel

The following formula is used for the dew-point temperature.

t: Temperature data

h: Relative humidity data

D: Dew-point temperature

1. K=t+273.15
2. In case of t≥0

   W=EXP(-5800.2206/K+1.3914993+K×(-0.048640239+K×(0.41764768E-4
   -0.14452093E-7×K))+6.5459673×LOG(K))/1000

   In case of T<0

   W=EXP(-5674.5359/K+6.3925247+K×(-9.677843E-3+K×(0.62215701E-6
   +K×(0.20747825E-8-9.484024E-13×K)))+4.1635019×LOG(K))/1000
3. S=W×h/100
4. P=S×1000
5. Y=LOG(P)
6. In case of P≥611.2

   D=-77.199+Y×(13.198+Y×(-0.63772+0.071098×Y))

   In case of P<611.2

   D=-60.662+Y×(7.4624+Y×(0.20594+0.016321×Y))

6) Moving average

Entering method of the formula

AVE (X#T)

AVEH (X#T)

X: Data channel number, T: Time series interval (second)

Mean value of past T seconds is calculated.

Difference between AVE and AVEH are the following.

	AVE	AVEH
Sampling cycle	1 second	0.1 seconds
Range of T	1 to 3600	1 to 300

7) Past data

Entering method of the formula

OLD (X#T)

OLDH (X#T)

X: Data channel number, T: Time in which go back (second)

Mean value of past T seconds is calculated.

Difference between OLD and OLDH are the following.

	OLD	OLDH
Sampling cycle	1 second	0.1 seconds
Range of T	1 to 3600	1 to 300

8) First-order leg filter

Entering method of the formula

IIR (X#T)

X: Data channel number, T: Time constant (second)

First-order calculate is performed in the data of channel X.

Contents of calculation

{dt÷(dt+t)} × (x-d) +d

dt: Sampling cycle (0.1 seconds fixed), t: time constant, x: current value of channel X, d: previous calculation result

9) Increment per time

Entering method of the formula

PLS (X#T)

X: Data channel number, T: Unit time (second)

Calculate increment per unit time T. X is specified from the channel that is set totalizer or the channel that is selected pulse range in 121 to 128.

As for the PLS function, when the totalized value is reset excluding reset by the overflow at time etc. , the data when resetting it becomes illegal (To do the same processing as overflow reset internally). Please do the operation construction noting the resetting operation when using it.

10) Wind display

Entering method of the formula

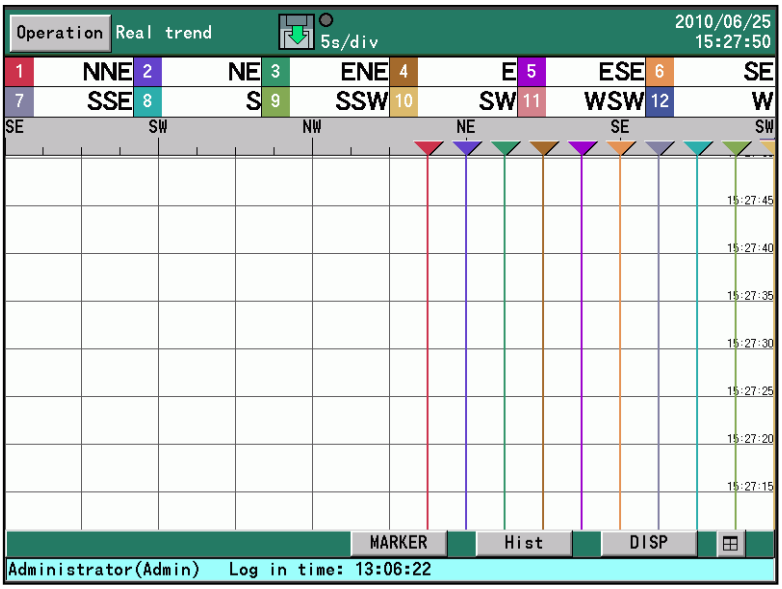
AZI (A)

A: Wind data

- Display the compass point which is changed from direction.
- Relation of the displayed direction of wind data is in the following list.
- If A is fractional value, display closest direction. Example: 1.2 → NNE

A	Display
•	•
•	•
•	•
-3	WNW
-2	NW
-1	NNW
0	N
1	NNE
2	NE
3	ENE
4	E
5	ESE
6	SE
7	SSE
8	S
9	SSW
10	SW
11	WSW
12	W
13	WNW
14	NW
15	NNW
16	N
17	NNE
18	NE
•	•
•	•
•	•

In addition, scale plate which is registered channel that is used this calculation is displayed wind scale.



Display coordinate on the trend is same as normal numeric data.

11) Example of formula combining calculations

- **(CH(1)*3-20)/6**
  (“Raw data of Channel 1”×3-20)÷6

- **(CH(1)+CH(2))<< 300**
  When the total of the raw data of Channel 1 and Channel 2 is less than 300, it becomes 1.

- **ABS(CH(1))>=50**
  When the absolute value of Channel 1 is 50 or more, it becomes 1.

- **(PCH(1)>=100)AND(PCH(2)<=50)**
  When the data of Channel 1 is 100 or more and the data of Channel 2 is 50 or less, it becomes 1.

Remarks Conbination of functions

The following functions can not be used together. The results are not calculated correctly.

ITG, AVE, AVEH, OLD, OLDH, IIR

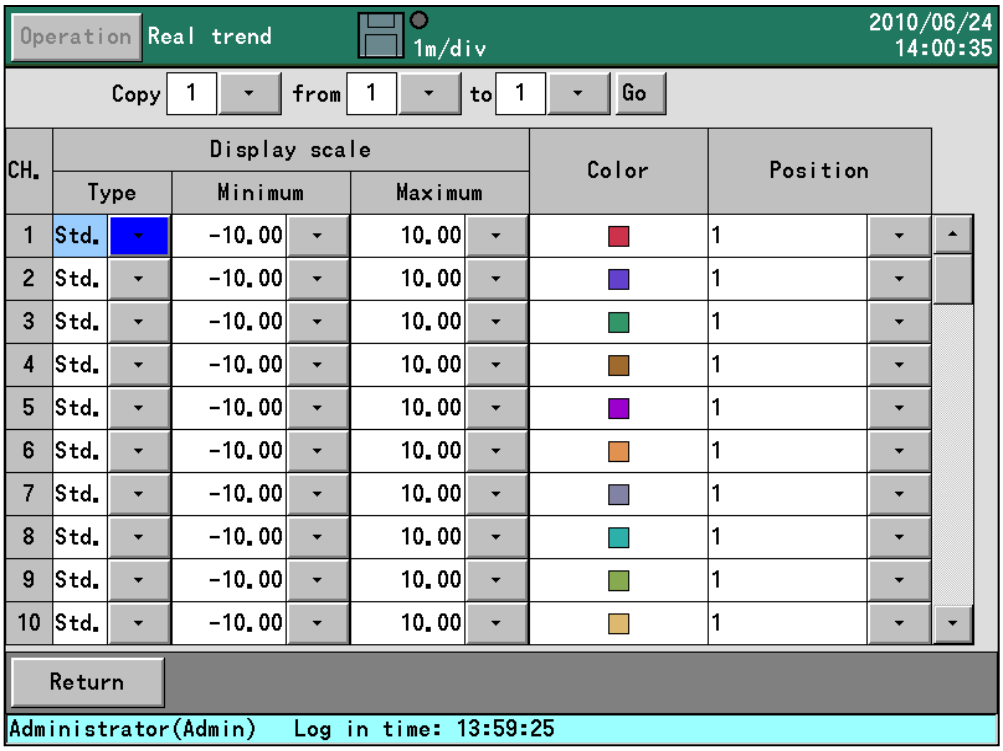
Example: AVE (OLD (1#10)#60) → NG

10.4 Display settings

10.4.1 Channel parameters

- Select [Display settings] - [Channel parameters] from the setting menu to display the following screen.
- You can set a display type or scale for each channel from this screen. Also, you can set a color of indicator and display position for graphs.

<Channel parameters setting screen>



■Setting the display scale

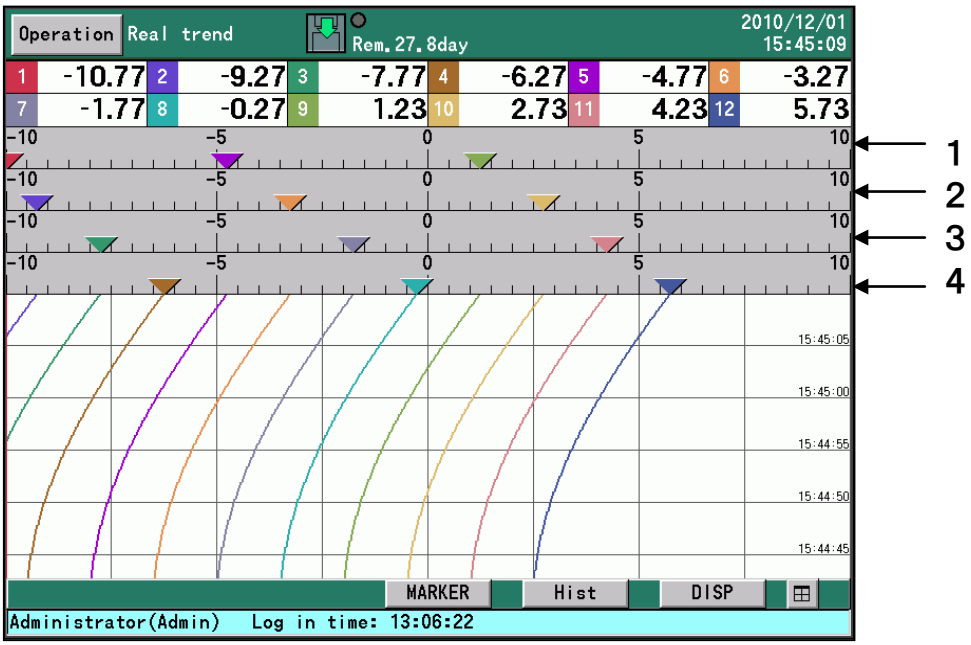
- The data are displayed on the screen with the setting contents of the display scale.

Item	Contents
Type	"Std.": Minimum and maximum values can be set in the range of ±30000. The screen is displayed in the standard format. "Expo": Minimum and maximum values are set in the exponent format. The screen is also displayed in the exponent format. The significand of minimum and maximum values is 1 to 9.99 and the exponent part can be set in the range of ±15.
Minimum/maximum	In the trend display, the minimum value is positioned at the extreme left (low) and the maximum value is positioned at the extreme right (up) by coordinate calculation. ( ) for horizontal direction When there are multiple channels displayed at the same position, the minimum and maximum values of the channel with the smallest number are displayed on the scale plate and the maximum and minimum values of each channel are used for the coordinate for each pen. The maximum and minimum values are displayed with the number of digits after decimal point displayed in the screen.

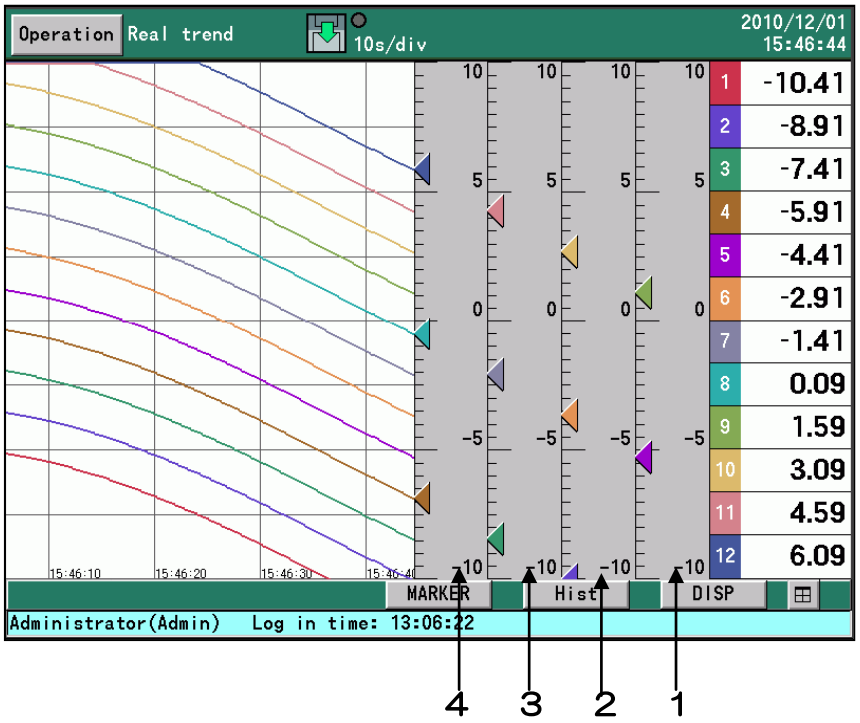
■Setting the display position

・ The position (1 to 4) indicates the position of the scale plate.

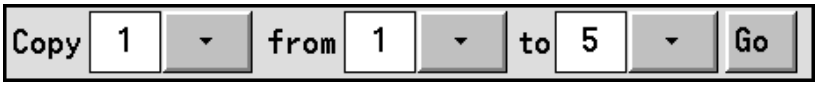
<For the vertical trend graph>



<For the horizontal trend graph>



■Copying the parameters with the copy function

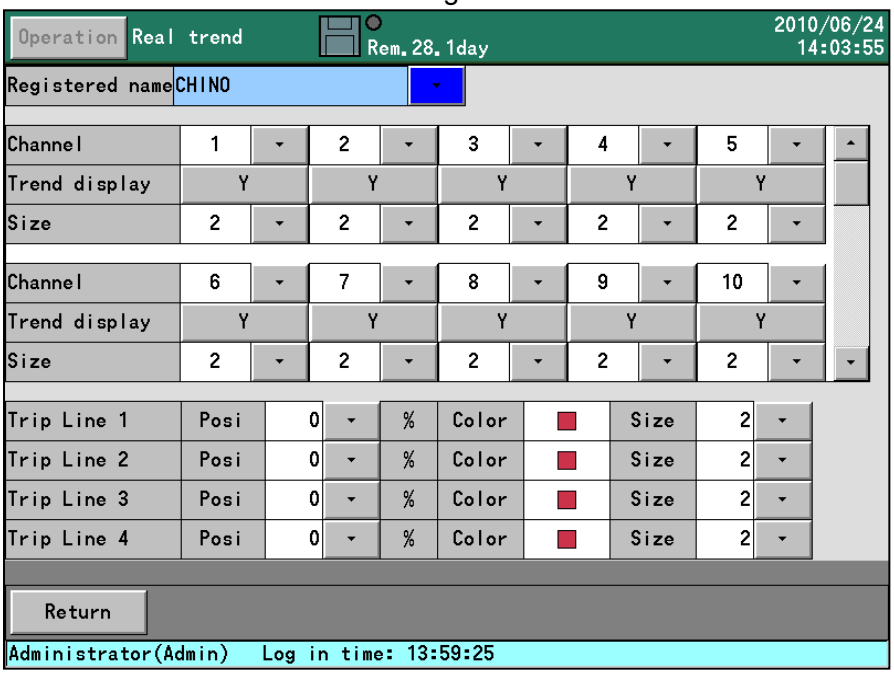


・ The above shows the setting for copying Channel 1 from Channel 1 to Channel 5. Tapping the [Go] button copies the setting of the channel 1 to the channels 1- 5. Colors are not copied.

10.4.2 Channel registration

- Tap [Display settings] - [Channel registration] in the setting menu to display the following screen.
- On this screen, you can register channels to be displayed on a graph.

<Channel registration screen>



■Setting the registration name

- Set a registration name for a channel. A registered name is used as a file name of recorded data as well as used for screen display.

■Setting the channel

- Set a channel to be registered. Setting a blank (pressing the down-arrow with “1” displayed or up-arrow with “44” displayed) cancels a registration.

■Setting the trend display

- You can switch the setting between “Y” and “N” with a single tap.
  When “N” is set, trend data will not be displayed even if the channel is registered. However, the data will be recorded to a file.

■Setting the trend line thickness

- Select a line thickness displayed on the trend data from 1, 3 and 5.

■Setting the trip line

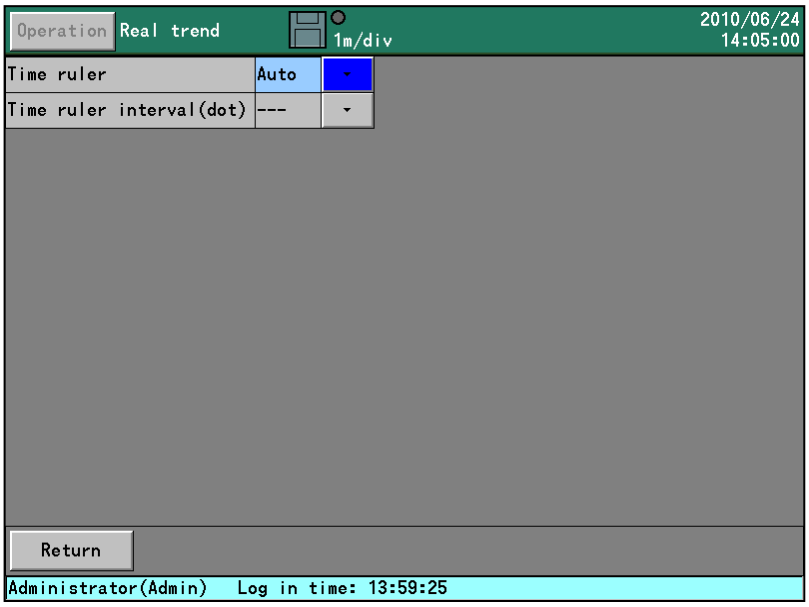
- Set a trip line (dashed line) displayed on the trend data.

Item	Description
Position	Set a display position of trip line within 0 to 99 % of the display width.
Color	Select a color of trip line from 48 types.
Size	Select a thickness of trip line from 1 to 5.

10.4.3 Ruler settings

- Tap [Display settings] - [Time ruler settings] in the setting menu to display the following screen
- You can set a scale interval on the ruler used for graphs from this screen.

<Ruler settings screen>



■Setting the time ruler

- Select either “Auto” or “Manual”. When “Auto” is selected, ruler interval is decided automatically according to the preset recording interval.

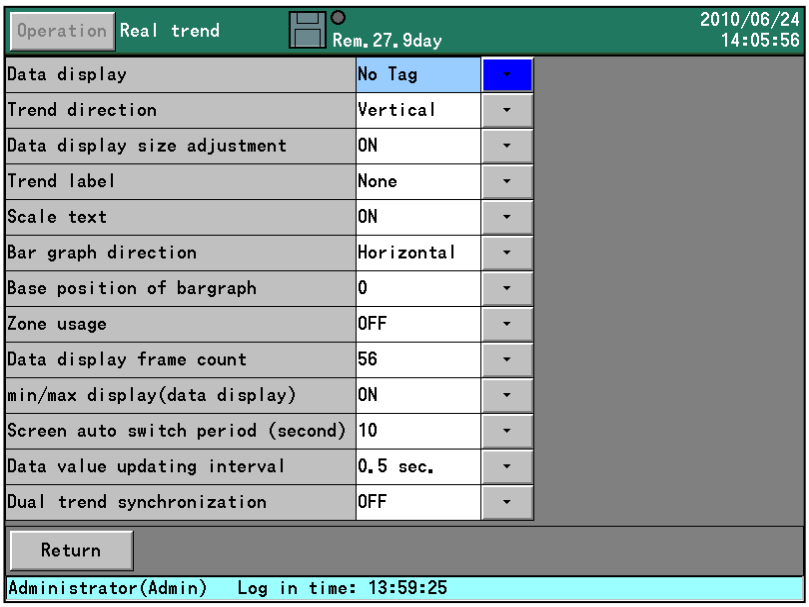
■Setting the time ruler interval

- Set a scale interval on the time ruler for trend graphs by specifying an even number from 12 to 510. This setting becomes effective when “Set” is selected for “Time ruler”.

10.4.4 Common parameters

- Tap [Display settings] - [Common parameters] in the setting menu to display the following screen.
- On this screen, you can set various graph-related items including direction of graph and zone use.

<Common parameters setting screen>



■Setting the data display

- Set the upper side (or right side) display of the trend screen to indicate the tag name, the bar graph or nothing.

No tag	With tag	Bar graph	Nothing

■Setting the trend direction

- Set the waveform direction to be vertical or horizontal.

■Setting the data display size adjustment

- This is the function which automatically sizes up data display on the trend screen when registered channel numbers are small. In the following cases, data is displayed by lager font.

Data display	Trend direction	Number of the registered CH
No tag	Vertical	Less than 4
With tag	Vertical	Less than 5
No tag	Horizontal	Less than 7
With tag	Horizontal	Less than 5

■Setting the trend label

- Set the label for displaying on the trend.

OFF	Channel	Tag

■Adjusting the scale text

- Set the scale plate to display the numerical values or not.

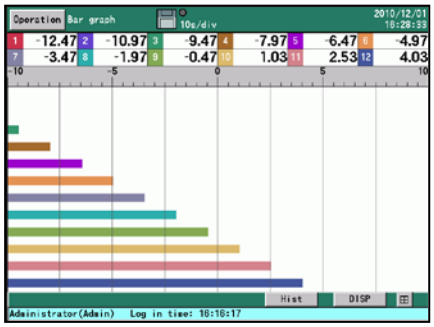
■Setting the bar graph direction

・ Set the bar graph direction on the bar graph screen to be vertical or horizontal.

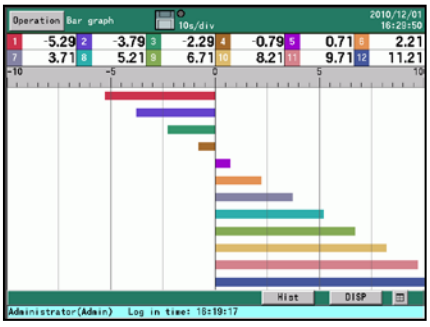
■Setting the base position of the bar graph

・ Set the base position of the bar graph from 0 to 100 on the bar graph screen. When the base position is 0, the bar is displayed based on leftmost (or bottommost). When the base position is 100, the bar is displayed based on rightmost (or uppermost).

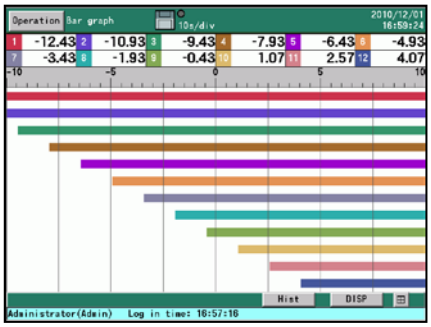
When standard position is 0



When standard position is 50



When standard position is 100



■Setting the zone usage※1

・ The display range of the measured/calculated data is called zone. When the zone is set to "ON", the display range can be divided into zones. The details are described in the next page.

■Setting the data display frame count

・ Set the division number of the numeric display frame.

1	2	3	4	6	8	9	10	12	24	36	48	56

■Setting the maximum/minimum display (data display)

・ Select [ON] or [OFF]. When select [ON], display minimum and maximum of channel data on the numeric display screen. However, if data display frame count is more than 24, minimum and maximum is not displayed.

■Setting the period for automatic switching of screen

・ Set the switching period if the “Auto switching” has been set to ON with the DISP menu.

■Setting the update interval for data display

・ Select the numeric value updating period of measured data to be displayed on the screen.

0.5 second	1 second

■Setting the dual trend synchronization

・ When previous file is opened by dual trend during ‘ON’, the file is scrolled as fast as real trend. When scroll end of the file, if there is continuous file, the file is opened automatically and scrolling is continued.

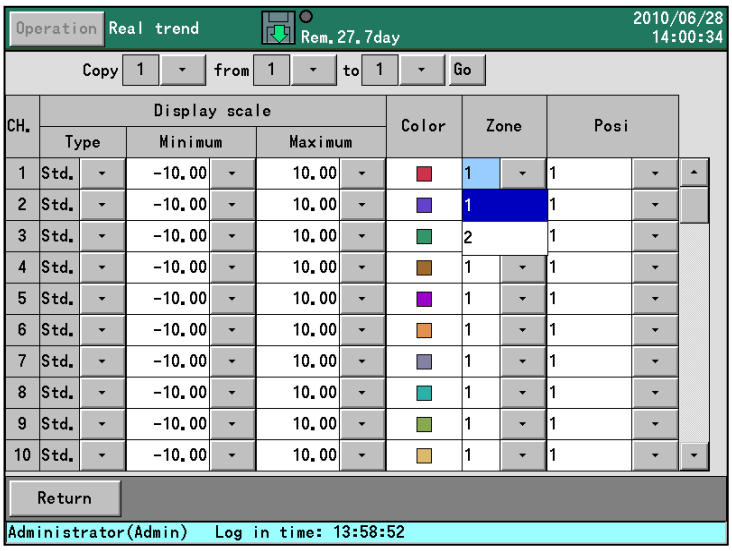
※1 Zone

The display range of the measured/calculated data is called zone. Since the data can be displayed by setting the zone for each channel, the data can be easily read by displaying the waveforms in separate zones.

<How to set>

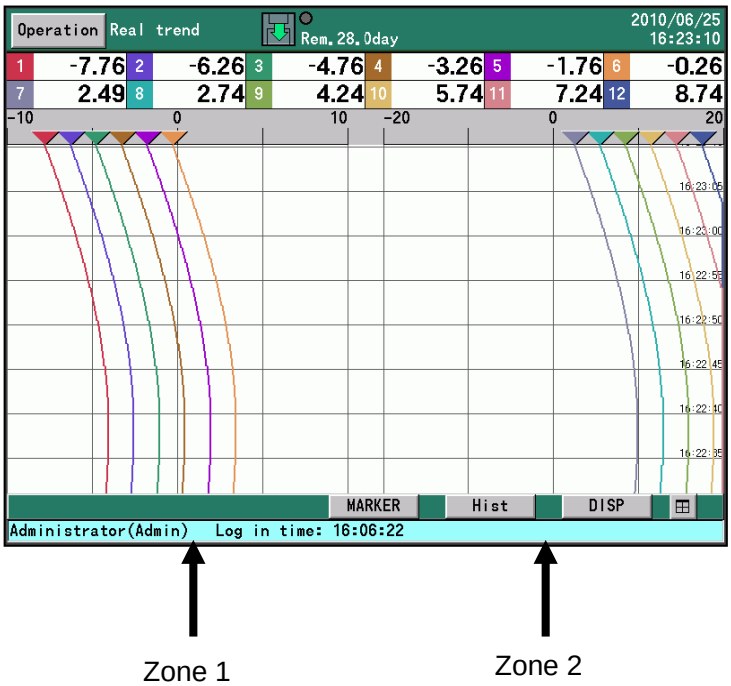
- Select [Display settings] - [Common parameters] from the setting menu and set [Zone usage] to [ON].
- After that, select [Display settings] - [Channel parameters] from the setting menu. The following screen will be displayed including the zone item.

<Channel parameters screen>



- When the zone is set to either 1 or 2, the display of wave format in the trend screen is divided into 2. Channels set by 1 are displayed in Zone 1 and channels set by 2 are displayed in Zone 2.

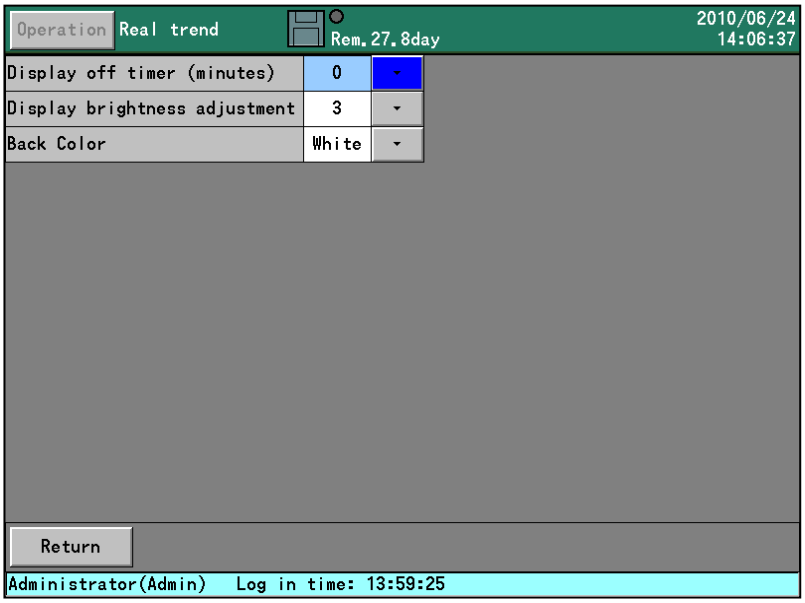
<Trend screen>



10.4.5 LCD settings

- Tap [Display settings] - [LCD settings] in the setting menu to display the following screen.
- You can set the display off timer or brightness from this screen.

<LCD settings screen>



■Setting the display off timer (minute)

- The display-off timer for the LCD can be set from 0 to 60 minutes.
- To cancel the display off function, touch the screen or press any key.

  *Display is not turned off when time of “0” is set.

  *If the alarm occurred when LCD display is OFF, LCD will light on. After the alarm is deactivated and after the set time is passed, LCD display will be OFF.

■Setting the display brightness

- Select the brightness of the LCD backlight from 4 steps. 1 is the brightest and 4 is the darkest.

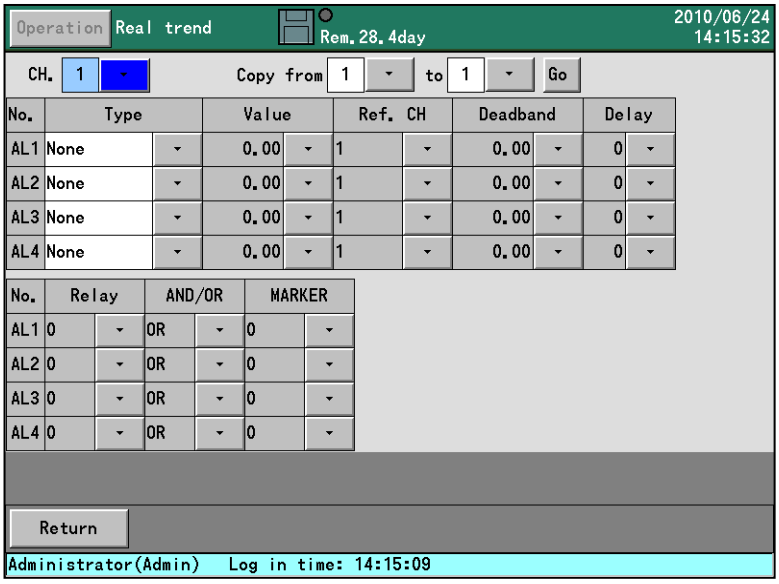
■Setting the back color

- Select the back color of the screen from white or black.

10.5 Alarm settings

- Tap [Alarm settings] in the setting menu to display the following screen.
- You can set an alarm activation condition for each channel from this screen.

<Alarm settings screen>



■Setting the type and the setting value

- Set the alarm type and the setting value for judgment.
  The alarms are activated by the following conditions.

None	Not activated		
Upper	The measured value is the set value or more.	Lower	The measured value is the set value or less.
Diff. upper※1	In case that the absolute value of the difference between the measured value and the reference CH is the setting value or more	Diff. lower※1	In case that the absolute value of the difference between the measured value and the reference CH is the setting value or less
Error	The measured value is not a numerical value. (BURN, OVER, UNDER, CAL ER, RJ ERR)		

■Setting the reference CH

- Set the reference channel for the differential high limit alarm/differential low limit alarm.

■Setting the deadband※2

- Set the alarm deadband between the alarm value and its release.

■Setting the delay※3

- Set the delay time for the alarm. (0 to 3600 seconds)
- The alarm is not output until the delay time has elapsed after the data exceeds the alarm value.

■Setting the relay

※The alarm output terminal (option) is necessary for outputting alarms actually.

- The relays can be set regardless of whether the alarm output terminal is used.
- Set the relays with the alarm output terminal number 0 ~ 24. When 0 is set, the alarm is not outputted.

■Setting the alarm output mode

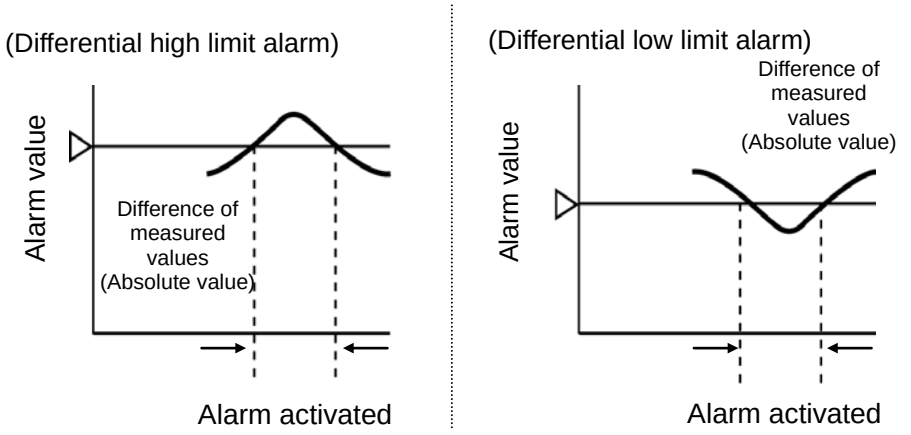
AND	The relay becomes ON when all alarms set in one alarm output terminal are activated.
OR	The relay becomes ON when any of alarms set in one alarm output terminal are activated.

When both of “AND” and “OR” are set to one relay channel, the relay becomes ON when either of “AND” of all alarms set with “AND” or all “OR” of alarms set with “OR” is established.

■Setting the maker

・ Set the automatically written maker on the trend for alarm activation. When 0 is set, the maker is not written.

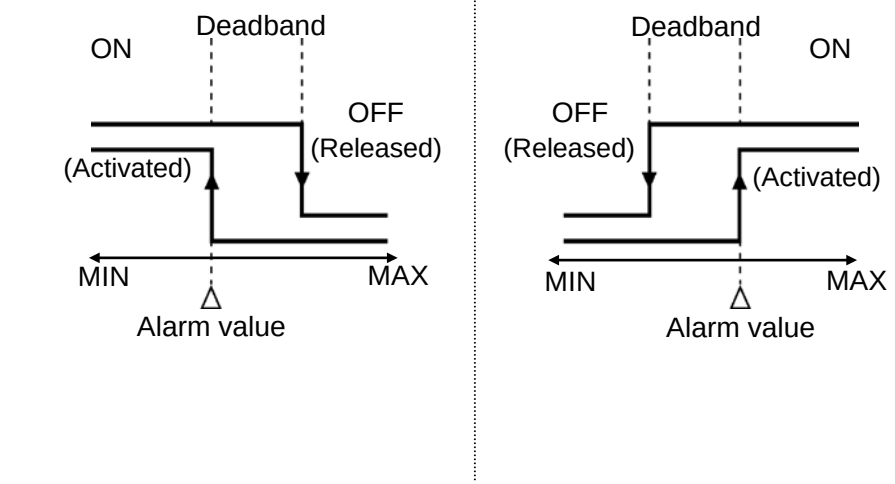
※1 Differential alarm



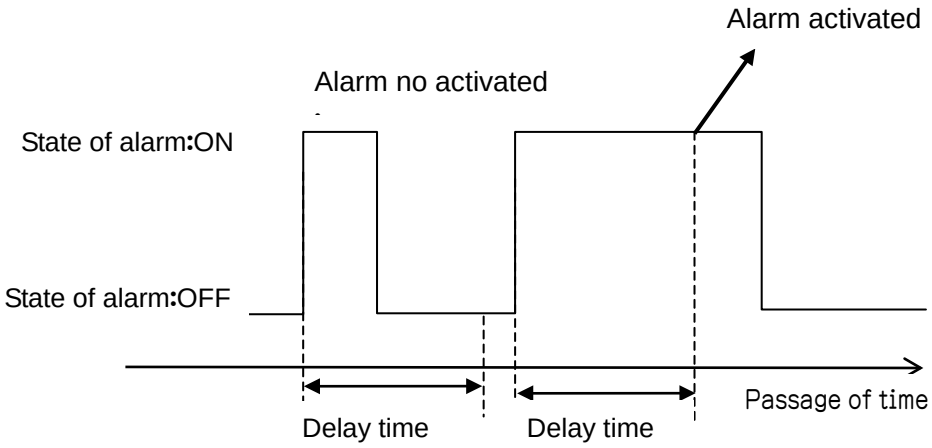
At “Difference of measured values ≥ Alarm value: Differential high limit alarm activated

At “Difference of measured values ≤ Alarm value: Differential low limit alarm activated

※2 Alarm deadband



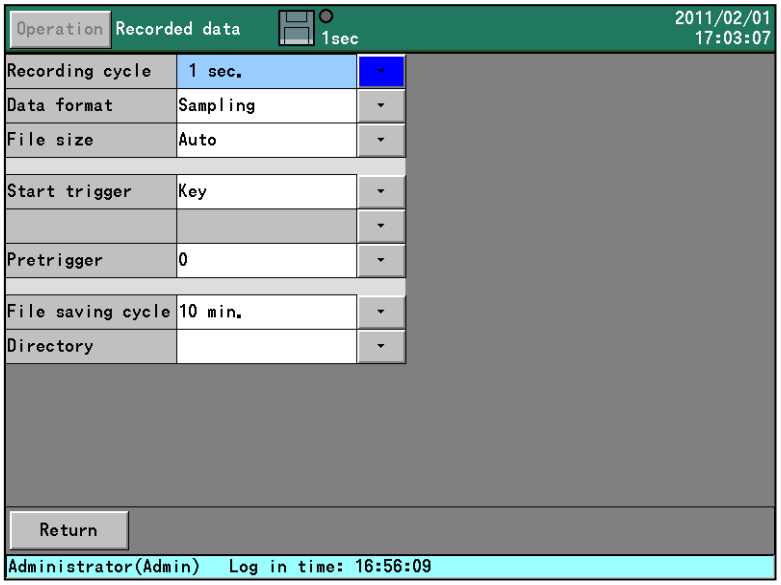
※3 About alarm DeLay



10.6 File settings

- Tap [File settings] in the setting menu to display the following screen.
- You can set various file-related items including recording cycle, means for recording start/stop and destination folder name for recorded data.

<File settings screen>



■Setting the recording cycle

Seconds	0.1 sec, 0.2 sec, 0.5 sec, 1 sec, 2 sec, 3 sec, 5 sec, 10 sec, 15 sec, 20 sec, 30 sec
Minutes	1 min, 2 min, 3 min, 5 min, 10 min, 15 min, 20 min, 30 min, 60 min

■Setting the data format

- The selected type of data within a recording cycle is recorded※1.

Sampling	Record an instantaneous measured value obtained within a recording cycle.
Average	Record an average measured value obtained within a recording cycle.
Highest	Record the highest measured value obtained within a recording cycle.
Lowest	Record the lowest measured value obtained within a recording cycle.
Highest/lowest	Record the highest and lowest measured values obtained within a recording cycle※2.

※1 When the recording cycle is 0.1 second, the sampling is only selectable.

※2 When the maximum/minimum is selected, the data size becomes 1.5 times larger.

■Setting the file size

- Set the file size. When the preset file size (period) is reached, the file is completed and the subsequent data will be stored in another file. Also, a file is completed when recording is stopped before the preset file size (period) is reached or when the limit of file size is reached (refer to “8.9 Recorded data screen” – “Save conditions of recorded data”).

Minute	10 minutes, 15 minutes, 20 minutes, 30 minutes, 60 minutes
Hour	2 hours, 3 hours, 4 hours, 6 hours, 8 hours, 12 hours, 24 hours
Other	1 week, 1 month, Auto

- With “Auto” selected, data is recorded until the file size upper limit is reached.

・ Recording period is calculated using the followings as reference.
For the case of "minutes" or "hours": "Time 0:00"
For the case of "1 week": "Sunday 0:00"
For the case of "1 month": "1st 0:00"

■Setting the start trigger

・ The recording starts by the following trigger.

Key	Alarm	Digital input (option)

Trigger type	Contents
Key	The recording starts with START key and stops with STOP key
Alarm	The recording starts when the alarm relay becomes ON. The instrument is put to the trigger standby state when the alarm relay becomes OFF When this item is selected, the relay terminal number can be selected. ※While writing data into internal memory, next recording cannot be started (trend remains in stop state).
Digital input (option)	The recording starts when the digital input terminal becomes ON. The instrument is put to the trigger standby state when the alarm relay becomes OFF When this item is selected, the input terminal number can be selected. ※While writing data into internal memory, next recording cannot be started.

※When the start trigger is set to “Alarm” or “Digital input”, press the START key to put the instrument to the trigger standby state.

■Setting the pretrigger (0 ~ 950)

・ When the recording starts, the past data retroactive to the count set here are recorded.
Example: When the recording starts at 13:00:00 with the pretrigger “10” and the recording cycle “2 seconds”, the data from 12:59:40 to 12:59:58 are added to the beginning of the file.
Note: When the power is turned off or the settings are changed, the data for the pretrigger are cleared, and the data in the interval specified here may not be enough. In this case, only the data being saved are added to the beginning of the file.

■Setting the file saving cycle

・ The cycle is for saving recorded data to internal data.
・ In addition to this cycle, the recorded data is also saved when “Save conditions of recorded data” are met (refer to 8.9 “Recorded data screen”).

Minute	No setting, 1, 2, 3, 5, 10, 20, 30, 60 min

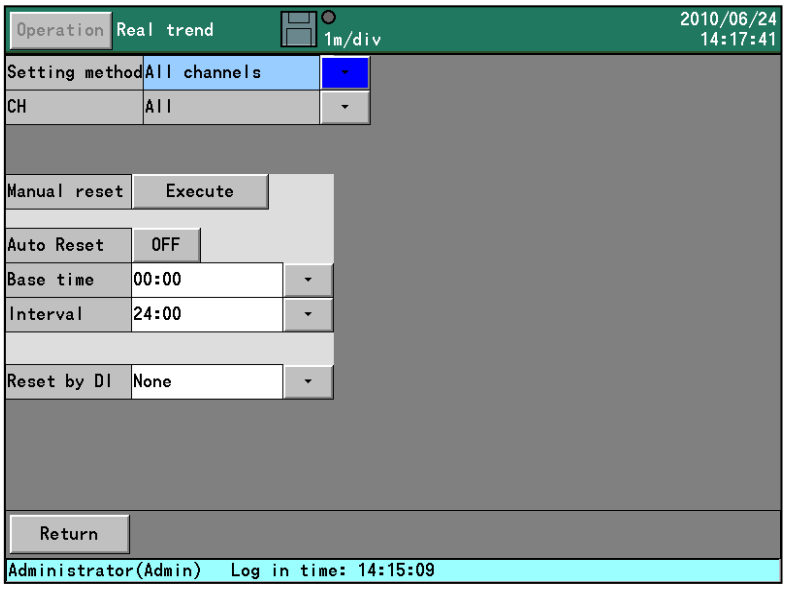
■Setting the directory (Maximum length 16 characters)

・ For saving the data to an external storage media, the directory name for saving can be set.
・ The hierarchy can also be specified. The delimiting symbol is “\” (backslash).
Refer to Para. “6.3 Character entering method”.

10.7 Totalizer reset settings

- Tap [Totalizer reset settings] in the setting menu to display the following screen.
- On this screen, you can set a condition for resetting a totalized data to “0” for the case the totalizer is selected for operation in [Input operation settings] (refer to “10.3.2 Setting method of formula”). The reset target is “ITG” formula only. For “ITG24” formula, reset is executed at reference time only, not at every interval.

<Totalizer reset settings screen>



■Setting the method

- Select ‘all channels’ or ‘individual channel’.

Setting method	Description
All channels	Reset setting is applied to all channels.
Individual channel	Reset setting is made individually for each channel.

■Setting the channel

- When select ‘individual channel’, setting is performed to specified channel.

■Executing the manual reset

- The totalized data is reset to 0 manually.

■Setting the auto reset

When the auto reset of totalizer is used, set it to ON. Set it to OFF when it is not used.

■Setting the base time and inteval

- The totalizer reset is executed at the following time.
  Base time + (Interval x n) n = 0, 1, 2, 3, •••

Example: When the base time is set at 0:00 and the interval is set at 04:00, the totalized value is reset at 0 o’clock, 4 o’clock, 8 o’clock, 12 o’clock, 16 o’clock and 20 o’clock.

■Setting the reset by digital input (option)

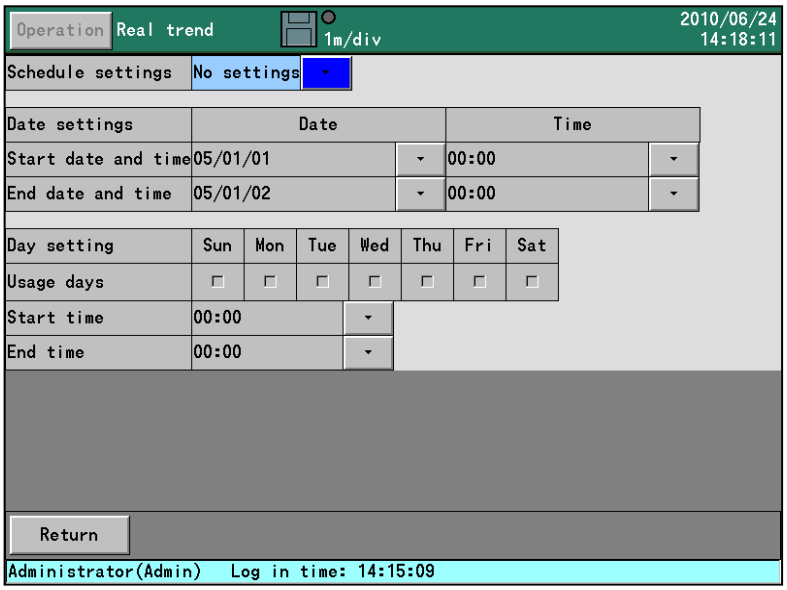
※When the instrument has not the digital input option, this item is not displayed.

- The totalizer reset is executed when the specified digital input terminal becomes ON. Select “None” when it is not used.

10.8 Schedule settings

- Tap [Schedule settings] in the setting menu to display the following screen.
- You can set a recording schedule from this screen. Even when the conditions set in the [File settings] are met, recording does not start out of the scheduled period specified in this screen.

<Setting the schedule screen>



■Setting the schedule

- Select it from No settings, date or day.
- By these settings, the following settings become enabled.

■Setting the parameters for the date settings

- Set the start date/time and the end date/time.

■Setting the parameters for the day setting

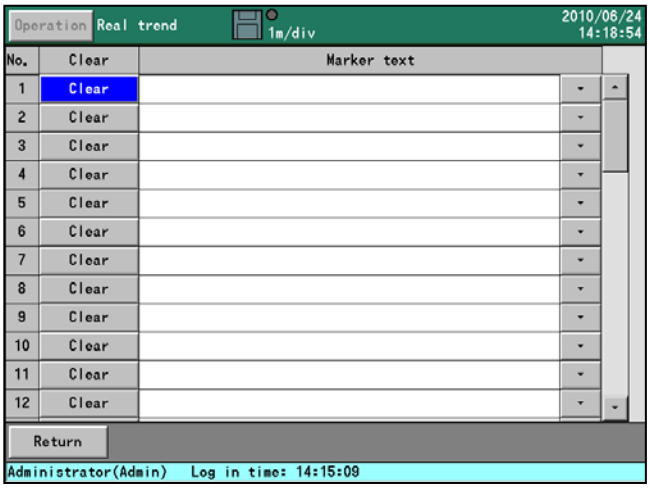
- Check the day for using.
- Set the start time and the end time.

10.9 Marker text settings

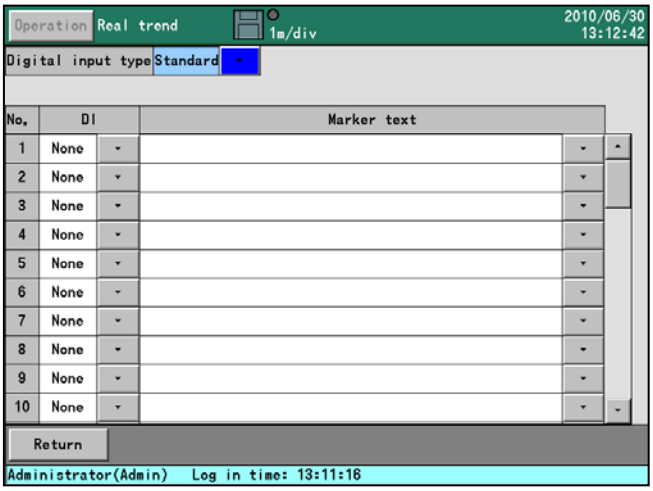
- Tap [Marker text settings] in the setting menu to display the following screen. The displayed screen varies when the digital input (option) is used.
- On this screen, you can register up to 50 marker texts (30 characters maximum for each text) to be written to the trend at a time. You can also create a marker text at the time you write a marker to the trend. Refer to “9.1 Marker writing” for details.

<Marker text settings screen>

(Without optional digital input)



(With optional digital input)



■Selecting clear

- Tapping [Clear] deletes the marker text of the selected number.

■Setting the marker text

- Tapping [▼] located beside the marker text field displays the character entry screen.

■Setting the marker writing with digital input (option)

- The maker can be written on the trends with ON from the digital input terminal.

<Digital input --- Standard>

- When the input terminal designated for the [digital input] becomes ON, the corresponded maker is written on the trends.

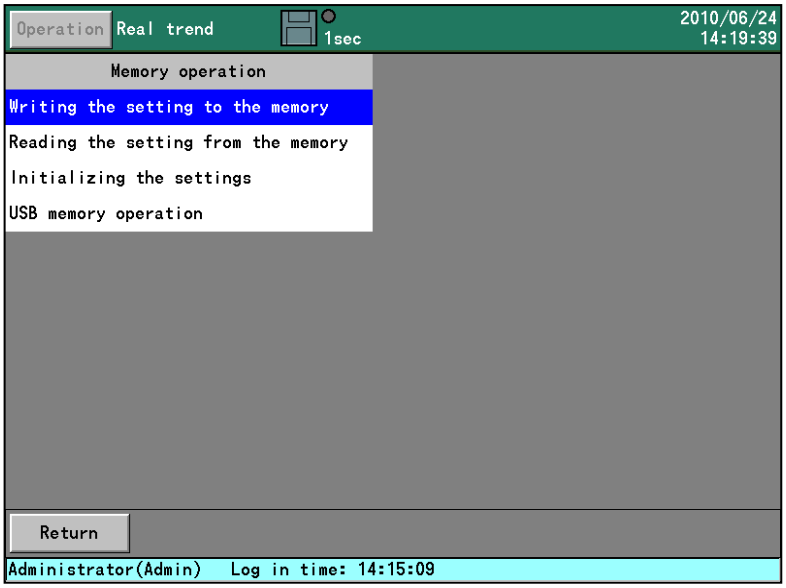
<Digital input --- Binary>

- Set the maker text number 1 to 50 by using the digital input terminal 1 to 7 (Binary expression of low bit at terminal 1 side and high bit at terminal 7 side).
- When terminal 8 is turned on under condition of the contact status of 1 to 50 at the terminal 1 to 7, the markers corresponding to the marker text numbers are written on the trends of the specified group.

10.10 Memory operation

- Select [Memory operation] from the setting menu and press the ENTER key to display the following screen.
- On this screen, you can save or read setting files of this instrument, or copy recorded data to USB memory.

<Memory operation screen>



■Writing the setting to the memory

- Up to 100 setting files can be saved.
- Saved setting files are listed in Japanese alphabetical or alphabetical order.
- When you touch the file you want to save, the file name entry screen is displayed. Enter a file name and tap the “Set” button to save the setting

※When you copy a setting file to USB memory, the file is saved in the “SETUP” folder with the extension “.krs” attached to it.

■Reading the setting from the memory

- A setting file is read to overwrite the current setting.
- Saved setting files are listed in Japanese alphabetical or alphabetical order.
- When you touch a desired file, reading of the file will be started.
- When a saved setting is read, password of each user will be initialized.

■Initializing the settings

- All settings except the security setting are initialized.

■USB memory operation

- You can copy a recorded data file, setting file or snapshot file of this instrument to USB flash memory (up to 8 Gbytes) by connecting it to the USB port of this instrument. Also, you can copy a setting file stored in USB memory to the internal memory (refer to “9.3 Data copy to USB memory”).

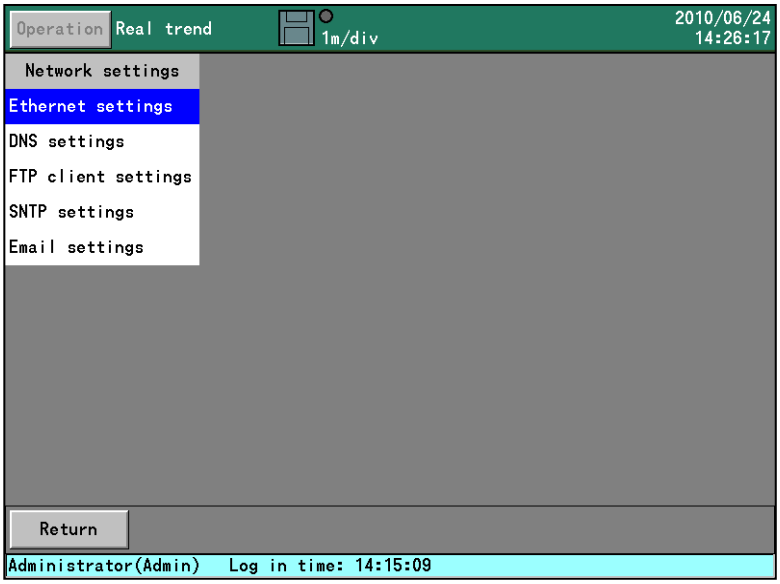
※Not all USB flash memory operations are guaranteed.

※Do not use external media such as hard disk, ZIP, MO and optical disk. Connecting any of these to the instrument may damage the connected medium.

10.11 Network settings

- Tap [Network settings] in the setting menu to display the following screen.
- On this screen, you can configure the network settings for the instrument.

<Network settings screen>



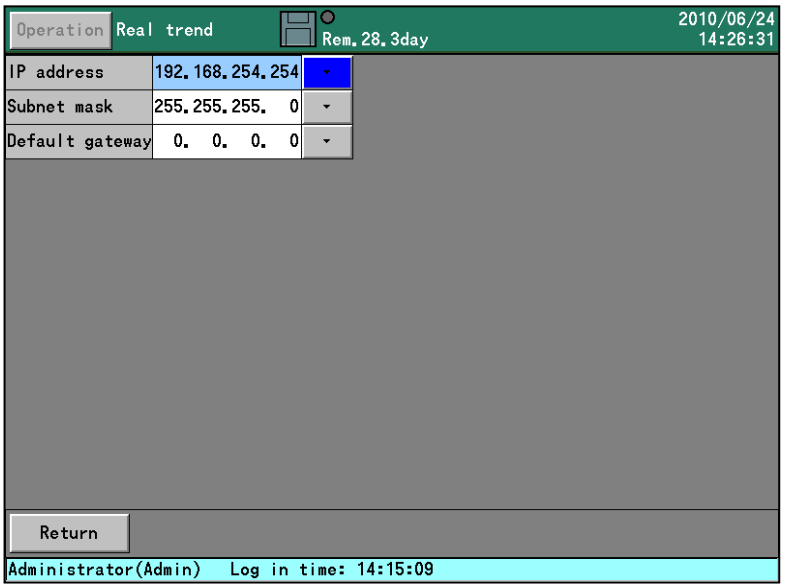
Network setting items

Ethernet settings	Refer to “10.11.1 Ethernet settings”.
DNS settings	Refer to “10.11.2 DNS settings”.
FTP client settings	Refer to “10.11.3 FTP client settings”.
SNTP settings	Refer to “10.11.4 SNTP settings”.
Email settings	Refer to “10.11.5 E-mail settings”.

10.11.1 Ethernet settings

- Tap [Network settings] - [Ethernet settings] in the setting menu to display the following screen.
- On this screen, you can set an address to use this instrument on the Ethernet.

<Ethernet settings screen>



■Setting the IP address

- Set IP address of this recorder. The DHCP (automatic assignment of IP addresses) cannot be used. Ask the IP address to the administrator for the network to connect.

■Setting the subnet mask

- Set the subnet mask of this recorder.

■Setting the default gateway

- If there is a gateway like a router, etc. on the network, set the default gateway address.

Example of usage in a small network

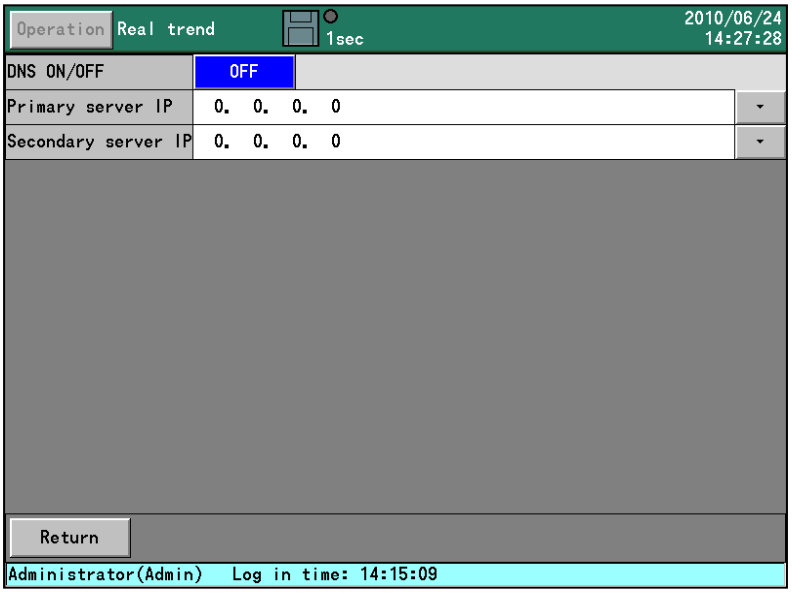
When this recorder is used in a small network without connecting to an interoffice LAN or Internet via a router, set the IP address as follows.

Instrument	IP address	Subnet mask
KR3000 A	192.168.254.254	255.255.255.0
KR3000 B	192.168.254.253	255.255.255.0
• • •	• • •	• • •
PC A	192.168.254.1	255.255.255.0
PC B	192.168.254.2	255.255.255.0
• • •	• • •	• • •

10.11.2 DNS settings

- Tap [Network settings] - [DNS settings] in the setting menu to display the following screen.
- You can configure the DNS server settings for this instrument. The DNS server is used to convert an address designated by the domain name into an IP address. Make sure to set the DNS server when you enter an address of servers such as FTP server, POP3 server and SMTP server by the domain name.

<DNS settings screen>



■Setting the DNS to ON/OFF

- Select the DNS from ON (enabled) or OFF (disabled).

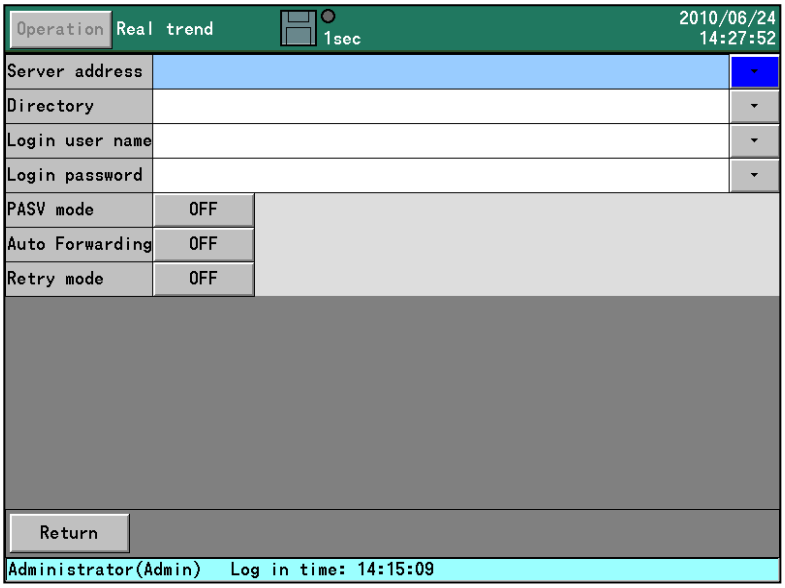
■Setting the primary server IP and secondary server IP

- Enter the address of the DNS server. If the primary server is not found, use the address of the secondary server. When there is only one DNS server, it is no problem not to enter any address to the secondary server.

10.11.3 FTP client settings

- Tap [Network settings] - [FTP client settings] in the setting menu to display the following screen.
- On this screen, you can configure the FTP client settings for this instrument.

<FTP client settings screen>



■Setting the server address

- Specify the address of the server for transferring the file. When the address is set with a name (○○.co.jp, ○○.com, etc.), not the IP address, make sure to set the DNS (Refer to “10.11.2 DNS settings”).

■Setting the directory

- Set the directory for writing the file. If there is no directory, the automatic creation cannot be executed.

■Setting the login user name

- Set the user name for logging into the FTP server.

■Setting the login password

- Set the password for logging into the FTP server.

■Setting the PASV mode

- Set to ON when the file is transferred with the PASV mode.

■Setting the auto forwarding function

- Set to ON for transferring the file created automatically at the switching of the file for recording.

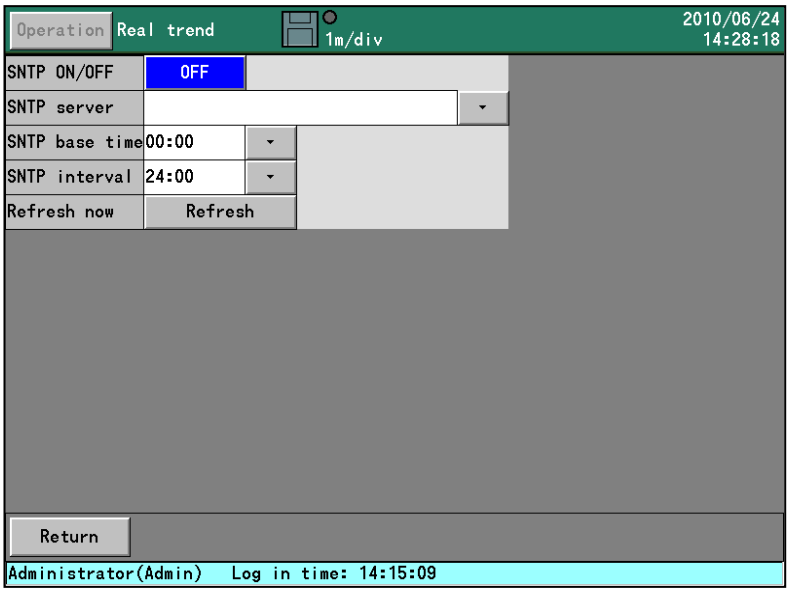
■Setting the retry mode

- When FTP transfer is failed three times on ‘OFF’, error message is displayed on the screen and stop transfer. When retry mode is ‘ON’, try to transfer until succeeding. However, when transfer-waiting files become over 360, files after 360 are not transferred.
  When turns off the power of the instrument, transfer–waiting files are not transferred after tuning on the power.

10.11.4 SNTP settings

・ Tap [Network settings] - [SNTP settings] in the setting menu to display the following screen.
・ On this screen, you can configure the SNTP settings for this instrument.

<SNTP settings screen>



■Setting the SNTP to ON/OFF
・ Set to “ON” when the automatic time synchronization by the SNTP is executed. If not executed, set to “OFF”.

■Setting the SNTP server
・ Specify the address of the SNTP server. When the address is set with a name (○○.co.jp, ○○.com, etc.), not the IP address, make sure to set the DNS (Refer to “10.11.2 DNS settings”).

■Setting the SNTP base time and interval
・ The time synchronization is executed at the following time.
base time + (interval x n) n = 0, 1, 2, 3, •••

Example: In case that the “SNTP base time” is 0:00 and the “SNTP interval” is 04:00, the time synchronization by the SNTP is executed at 0 o’clock, 4 o’clock, 8 o’clock, 12 o’clock, 16 o’clock and 20 o’clock.

■Refresh now
・ When the “Refresh” button is tapped, the time synchronization with the SNTP server is executed.

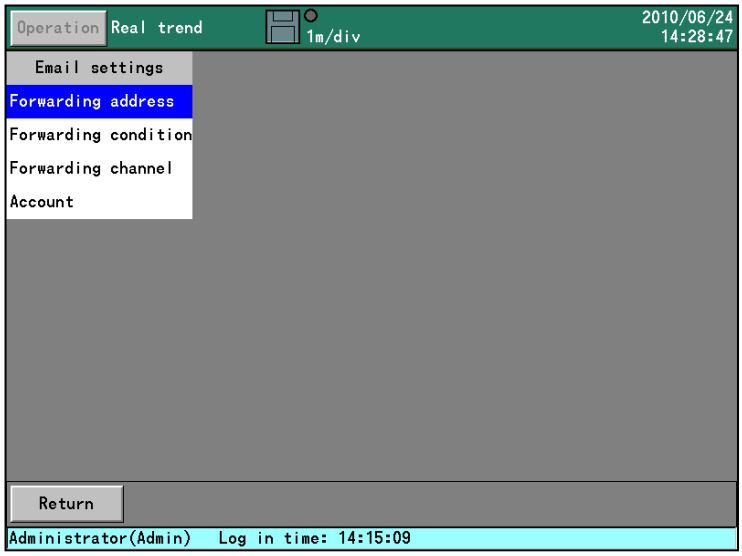
Example of SNTP sever

・131.107.1.10.....NIST
・198.123.30.132..NASA
・133.100.9.2.....Fukuoka University
・133.100.11.8.....Fukuoka University
・133.40.41.175....National Astronomical Observatory (Mizusawa VERA Observatory)
・130.69.251.23...The University of Tokyo
・130.34.48.32.....Tohoku University
・157.16.213.52...Osaka Prefecture University
・133.41.4.1.....Hiroshima University
・210.173.160.57..National Institute of Information and Communications Technology (NiCT)
・210.173.160.87..National Institute of Information and Communications Technology (NiCT)

10.11.5 E-MAIL settings

- Tap [Network settings] - [Email settings] in the setting menu to display the following screen.
- On this screen, you can configure the e-mail settings for this instrument. This instrument can send e-mails at an occurrence of alarm or time event. Specify up to 8 forwarding addresses in advance. When an event (up to 8 events can be set) occurs, an e-mail is sent to the selected address.

<E-mail settings screen>



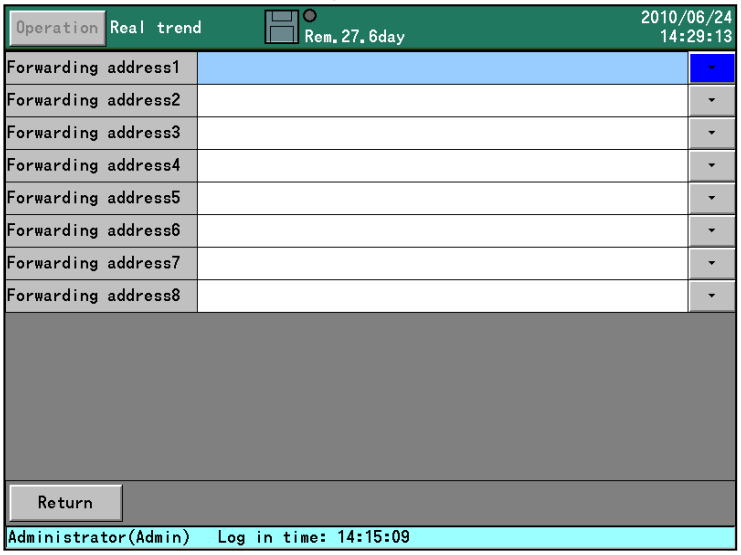
E-mail setting items

Forwarding address	Refer to “Setting the forwarding address” described below.
Forwarding condition	Refer to “Setting the forwarding condition” described below.
Forwarding channel	Refer to “Setting the forwarding channel” described below.
Account	Refer to “Setting the account” described below.

■Setting the forwarding address

- Selecting this item displays the following screen. You can specify up to 8 forwarding addresses on this screen.

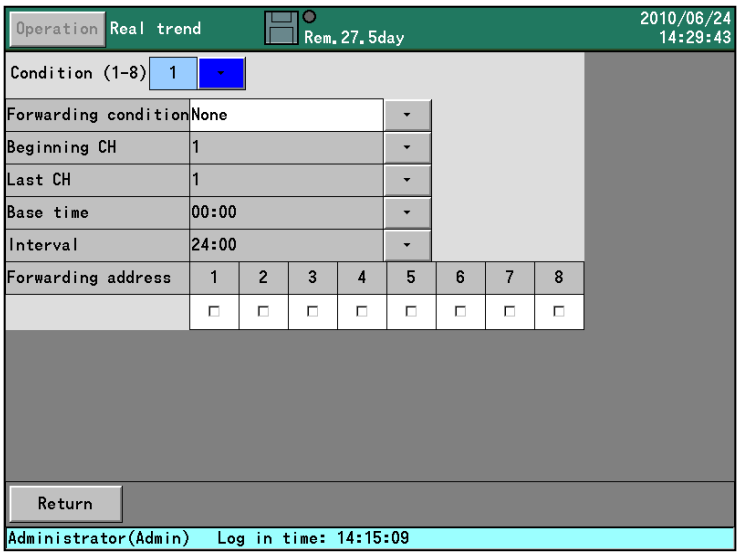
<Forwarding address screen>



■Setting the forwarding condition

・ Selecting this item displays the following screen. On this screen, you can set up to 8 conditions for forwarding e-mails.

<Forwarding condition setting screen>



• Selecting the condition number

Up to 8 types of the e-mail forwarding condition can be registered. On this screen, set conditions for the number selected here.

• Selecting the forwarding condition

Set the condition for forwarding the e-mail to the forwarding addresses.

Item	Contents
None	This condition is not used.
Alarm activation time	The e-mail is forwarded when the alarm is activated at the specified channel.
Fixed interval	The e-mail is forwarded at every interval time based on the base time.

• Beginning CH, Last CH

These settings are effective then the “Alarm activated time” is selected in the forwarding condition. The e-mail is forwarded when the alarm is activated in the channels specified by the starting channel and the ending channel.

• Base time, Interval

These settings are effective when the “Fixed interval” is selected in the forwarding condition.

The e-mail is forwarded at the following time.

Base time+ (Interval x n) n = 0, 1, 2, 3, •••

Example: In case that the “Base time” is 0:00 and the “Interval” is 04:00, the e-mail is forwarded at 0 o’clock, 4 o’clock, 8 o’clock, 12 o’clock, 16 o’clock and 20 o’clock.

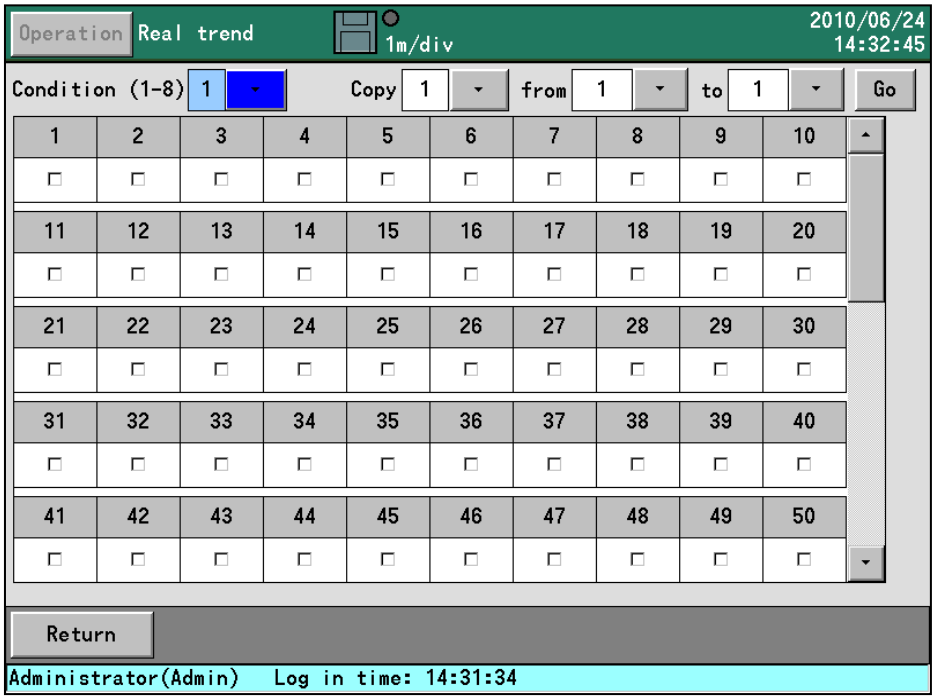
• Forwarding address

Check the addresses for forwarding.

■Setting the forwarding channel

- By selecting, the following screen is displayed.
- When the “Alarm activation time” is specified for the Forwarding condition, the e-mail is forwarded by writing the data of the channels, which are registered on this screen, into the message body. When no channel is selected, the e-mail is forwarded by writing the data of the alarm activation channels.
- When the “Fixed interval” is specified for the Forwarding condition, the e-mail is forwarded by writing the data of the channels, which are registered on this screen, into the message body.

<Forwarding channel screen>



• Selecting a condition number

Select the e-mail forwarding condition number for the settings.

• Setting the forwarding data

Check the channel numbers for attaching the data.

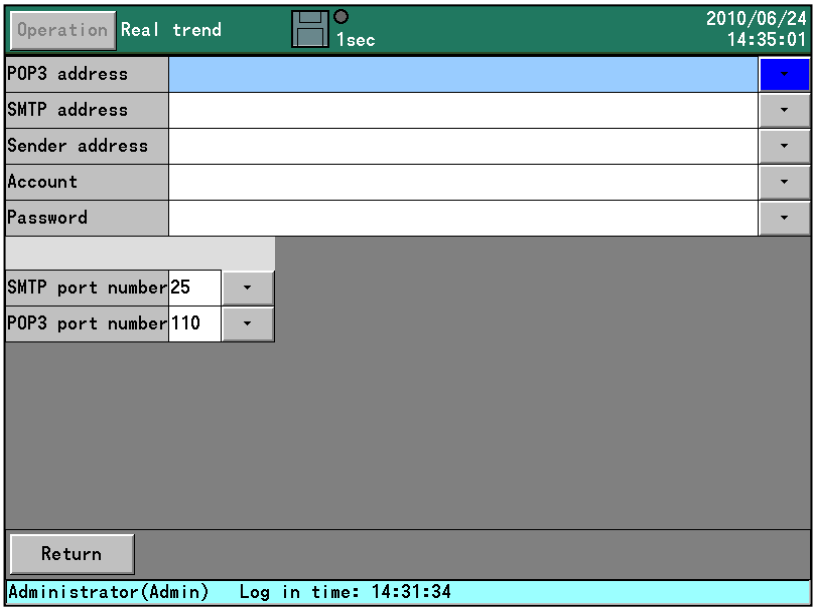
• Copying the parameters with the copy function

The above shows the setting for copying Channel 1 from Channel 1 to Channel 5. Tapping the [Go] button copies the setting of the channel 1 to the channels 1- 5.

■Setting the account

・ Selecting this item displays the following screen. You can configure the SMTP (Simple Mail Transfer Protocol) settings on this screen.

<Account screen>



- **Setting the POP3 address**
  This address is used when the SMTP server requires the POP3 authentication. Enter the address of the POP3 server. Do not enter anything when POP3 authentication is not required.

- **Setting the SMTP address**
  Enter the address of the SMTP server.

- **Setting the sender address**
  Enter the e-mail address obtained for this recorder. When this address is not correct, some SMTP servers do not accept the transmission of the e-mail.

- **Setting the account**
  Enter the mail account for logging into the mail server.

- **Setting the password**
  Enter the password for logging into the mail server.

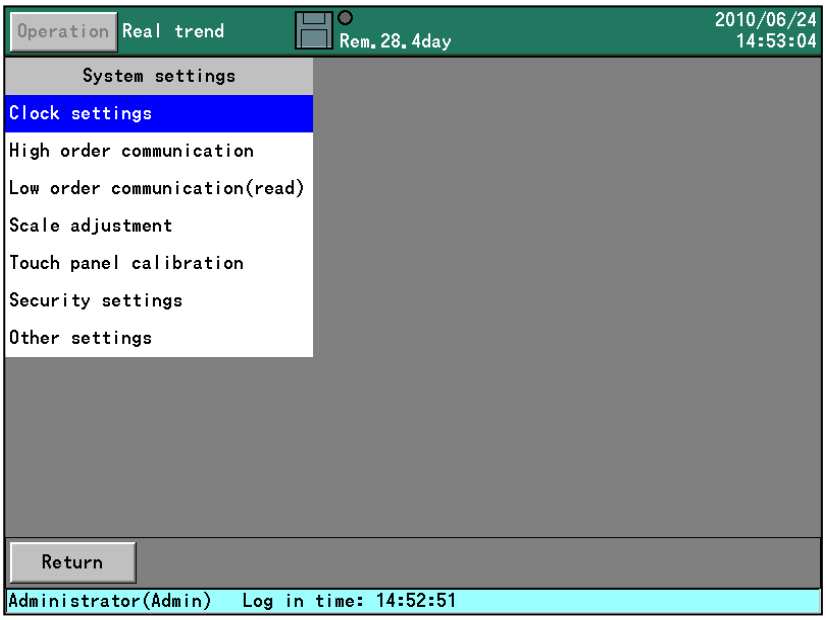
- **Setting the SMTP port number**
  Enter the port number of SMTP. Standard saver is 25.

- **Setting the POP3 port number**
  Enter the port number of pop3. Standard saver is 110.

10.12 System settings

- Tap [System settings] in the setting menu to display the following screen.
- On this screen, you can configure the system settings including clock, communication and user registration for this instrument.

<System settings screen>



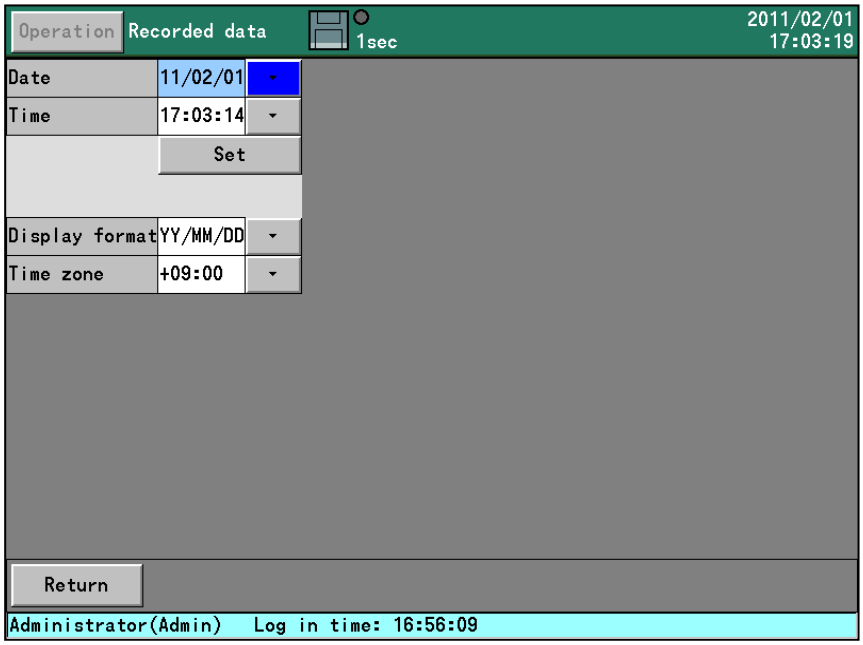
System setting items

Clock settings	Refer to “10.12.1 Clock settings”.
High order communication	Refer to “10.12.2 High order communications settings”.
Low order communication	Refer to “11.1 Low order communications (read)” and “11.2 Low order communications (write)”. *Not displayed when the low order communication option is not used.
Scale adjustment	Refer to “10.12.3 Scale adjustment”.
Touch panel calibration	Refer to “10.12.4 Touch panel calibration”.
Security settings	Refer to “10.12.5 Security settings”.
Other settings	Refer to “10.12.6 Other settings”.

10.12.1 Clock settings

- Tap [System settings] - [Clock settings] in the setting menu to display the following screen.
- You can set the clock of this instrument from this screen.

<Clock settings screen>



■Setting the date and time

- Enter the date in the same way as the character entering.
- Tap [System settings] - [Clock settings] in the setting menu to display the following screen.

■Selecting the display format

- Select the display format of the date.

YY/MM/DD	Year/month/day
MM/DD/YY	Month/day/year
DD/MM/YY	Day/month/year

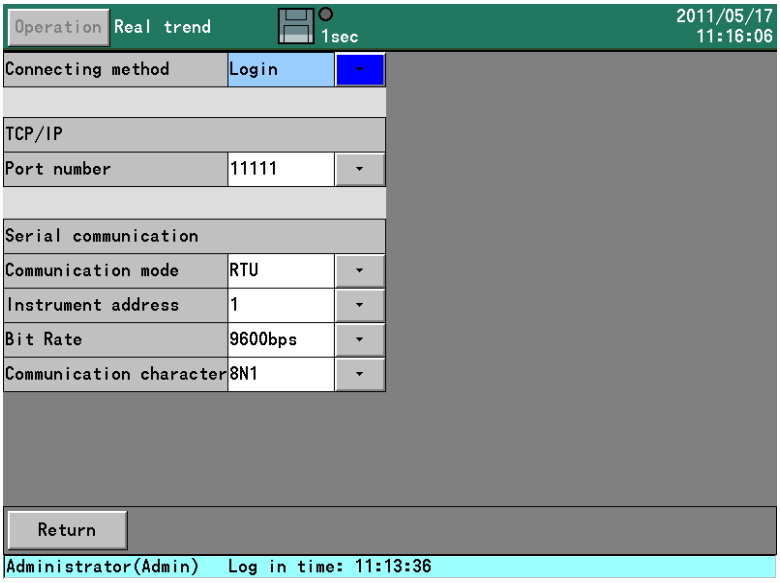
■Setting the time zone

- Set the time difference from Greenwich Mean Time (GMT). This setting is reflected in sending time of e-mail header.

10.12.2 High order communication settings

- Tap [System settings] - [High order communication] in the setting menu to display the following screen.
- You can set the high order communication for this instrument.。

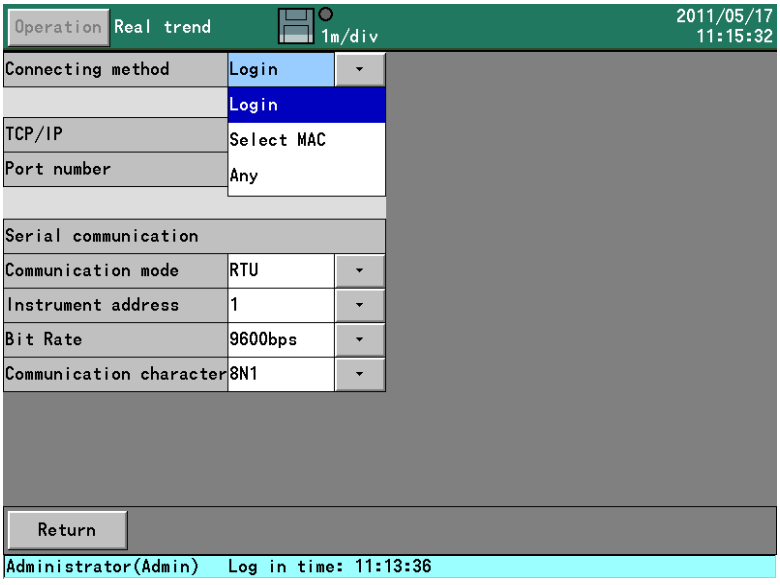
<High order communication screen>



■Setting connecting method

Set the high order communication method.

<Connecting method selection screen>



List of connecting method

Login	Login is required to write the settings.
Select MAC	Permit communication only from the registered MAC address.
Any	Permit all communications.

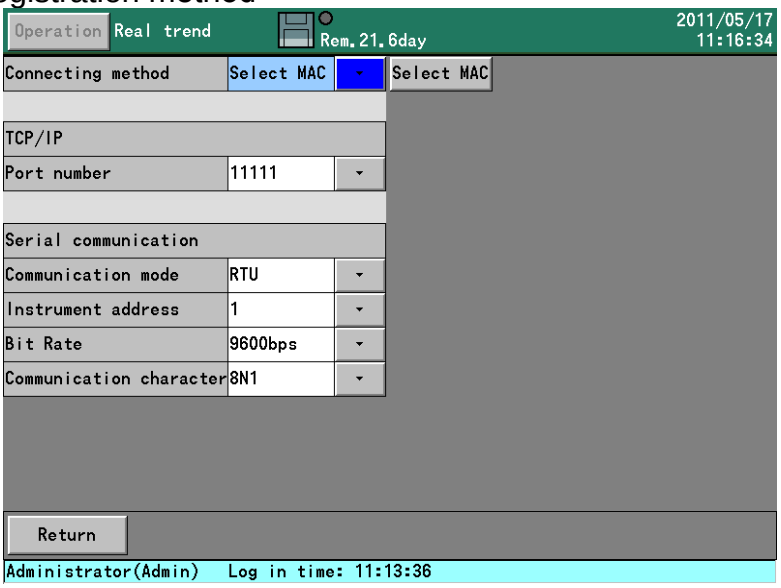
LOGIN

It requires login operation (user ID/password registration) during communication.
*Only the login administrator can operate / change settings by high order communication.
*It is unnecessary when reading the data by high order communication.

Select MAC

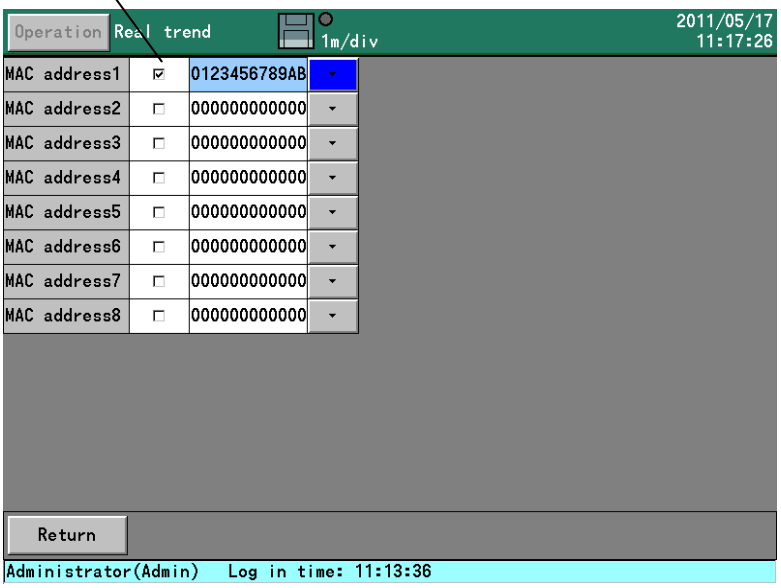
It permits all communication from the registered MAC address by this unit.
You can register the MAC address up to 8.
*MAC address (Media Access Control address) is a unique ID number of each unit to discriminate each other on the Ethernet.
*You cannot communicate from the unregistered unit.
*If you changed the settings by high order communication, then that unit MAC address is saved on audit.
* If used the optional serial communication, then this limit is not applied.

<MAC address registration method>



Move the cursor to [Select MAC] and press ENTER key to display MAC address registration screen.

Settings will be valid after you checked.



Any

It permits all communication.
* If you changed the settings by high order communication, then user MAC address is saved on audit.

■Setting the TCP/IP port number

- Set the port number for executing the high order communications by TCP/IP.
- When port number is set 502, it is possible to communicate by Modbus-TCP. When port number is set other than 502, this instrument communicates by own communication method.
  When use our company's PC software such as CISAS, TRWIN, KIDS and PASS for high order application, set the number except 502. When use the PC software corresponding commercial Modbus-TCP, set 502.

■Setting the serial communication (Option)

※Serial communication is not displayed unless the instrument does not have communication interface option, or the instrument has the option, and "High" is selected in the setting menu [System settings] - [Other settings] - [Select communication type] (Refer to "10.12.6 Other settings").

- Set the following items according to the settings of the high order application.

Item	Description
Communication mode	Select the communication mode from "RTU" or "ASCII".
Instrument address	Set a value from 1 to 31.
Bit rate	Select the bit rate from "9600bps" or "19200bps".
Communication character	Select a combination of the data bit, parity and stop bit.

(Select a code from the following table)

Code	Character length	Parity	Stop bit
7E1	7 bits	Even number	1
7E2			2
701		Odd number	1
702			2
8N1	8 bits	None	1
8N2			2
8E1		Even number	1
8E2			2
801		Odd number	1
802			2

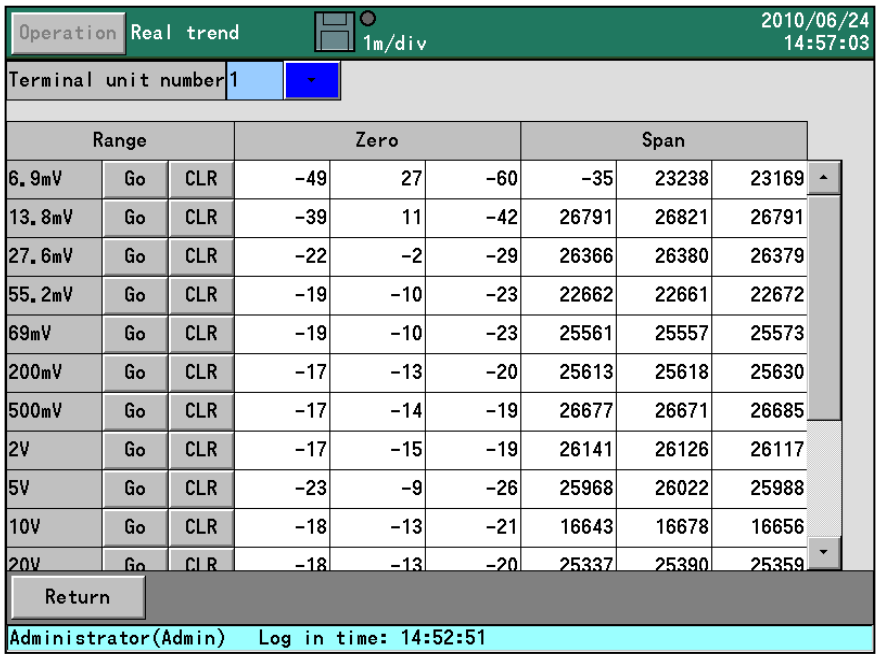
Remarks

Changing the setting by high order communication is available only when the KR is logout. If the KR is log on, then you cannot change the setting by high order communication. (It will reply error code to the setting change request.)

10.12.3 Scale adjustment

- Tap[System settings] - [Scale adjustment] in the setting menu to display the following screen.
- On this screen, you can adjust the scale for this instrument (refer to “ 12 Scale adjustment”).

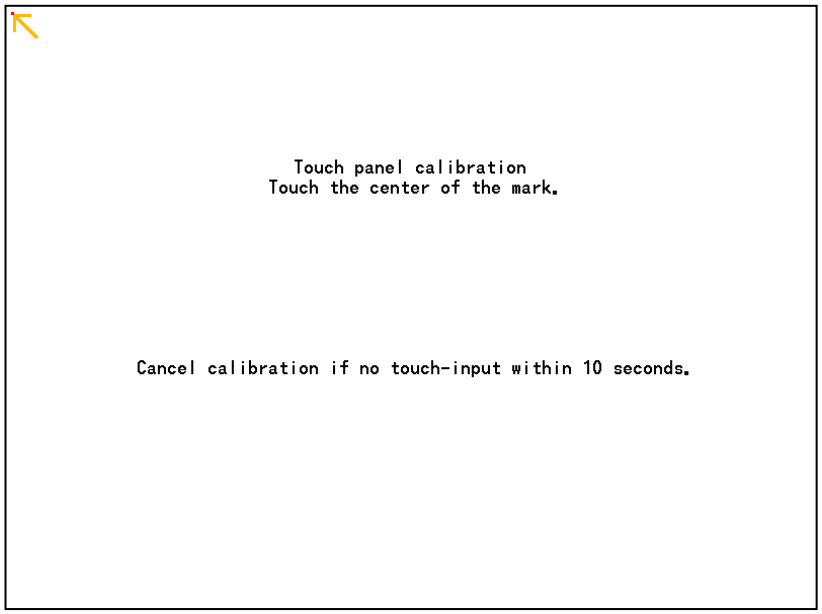
<Scale adjustment screen>



10.12.4 Touch panel calibration

- Tap [System settings] - [Touch panel calibration] in the setting menu to display the following screen.
- On this screen, you can calibrate the touch panel of this instrument. The touch panel has been calibrated at the factory but the coordinates may be out of alignment as time passes. In this case, execute the coordinate calibration of the touch panel on this screen.
- Tap the top of the arrow with the stylus. The arrow moves when the tapping is recognized. The coordinate calibration of the touch panel is completed by repeating this operation up to 5 locations.

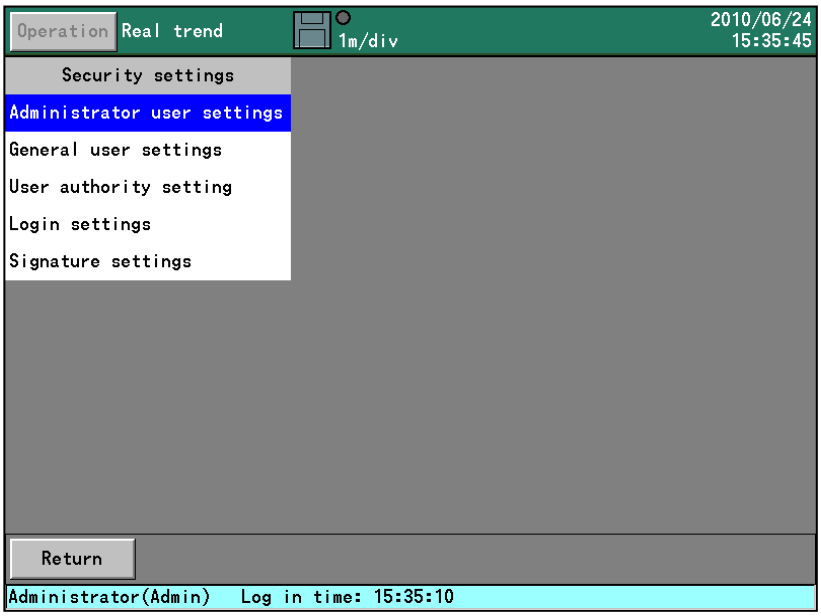
<Touch panel calibration screen>



10.12.5 Security settings

- Tap [System settings] - [Security settings] in the setting menu to display the following screen.
- On this screen, you can set security-related items including user registration, general user authority and login settings. The security settings can be performed by administrator user only.

<Security settings screen>



Security setting items

Administrator user settings	Refer to “Registering the administrator user” described below.
General user settings	Refer to “Registering the general user” described below.
User authority setting	Refer to “Setting the user authority” described below.
Login settings	Refer to “Setting the login” described below.
Signature settings	Refer to “Setting the signature” described below.

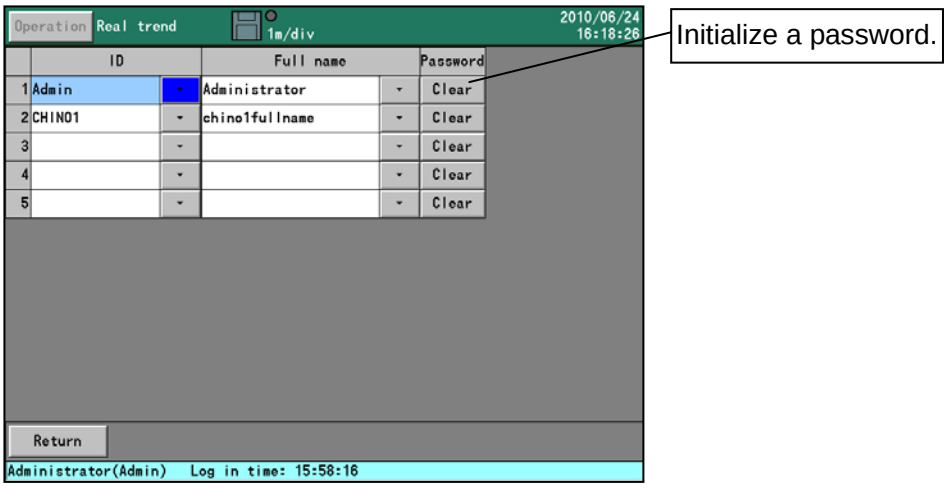
■Registering the administrator user

・ On this screen, you can register as an administrator user or initialize a password.

※Register two or more administrator users.

※You cannot set previously used IDs and full names (up to 1000 previous IDs/full names).

<Administrator user registration screen>



ID	Set a login ID required when you login to the instrument.
Full name	Set a user name displayed in the lower left of the screen.

<Administrator user default passwords>

	Default password
Administrator user 1	Admin1
Administrator user 2	Admin2
Administrator user 3	Admin3
Administrator user 4	Admin4
Administrator user 5	Admin5

Remarks About user registration

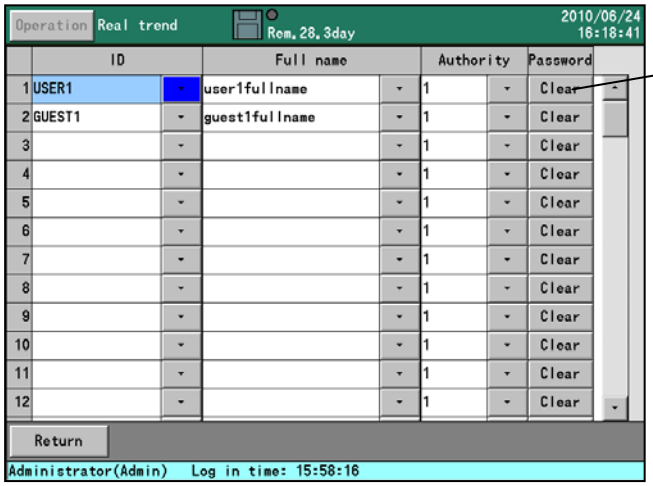
Register two or more administrator users. Keep the passwords secure and be careful not to forget them. In case that all the registered administrator users become unable to login (lock-out), an administrator user login will become impossible from that time forward. In this case, contact your nearest CHINO office.

■Registering the general user

・ On this screen, you can register as a general user, initialize a password or set authority.

※You cannot set previously used IDs and full names (up to 1000 previous IDs/full names).

<General user registration screen>



ID	Set a login ID required when you login to the instrument.
Full name	Set a user name displayed in the lower left of the screen.
Authority	Set the functions used by general user (refer to “Setting the user authority”).

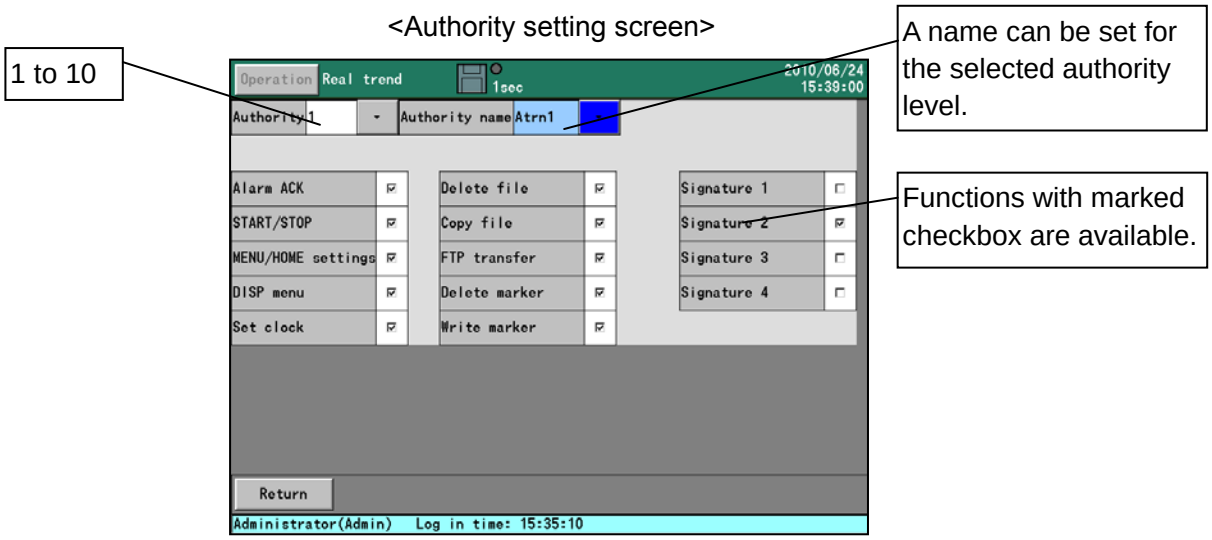
<General user default password>

	Default password
General user 1	User1
General user 2	User2
:	:
:	:
General user 100	User100

■Setting the user authority

・ You can set the functions used by general user from this screen. Only the functions with marked checkbox can be operated by general user.

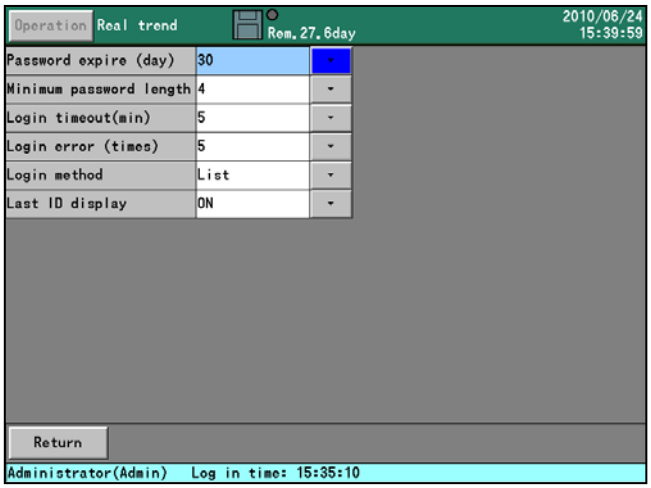
<Authority setting screen>



■Setting the login

・ On this screen, you can set login-related settings including an expiration date and login timeout.

<Login settings screen>

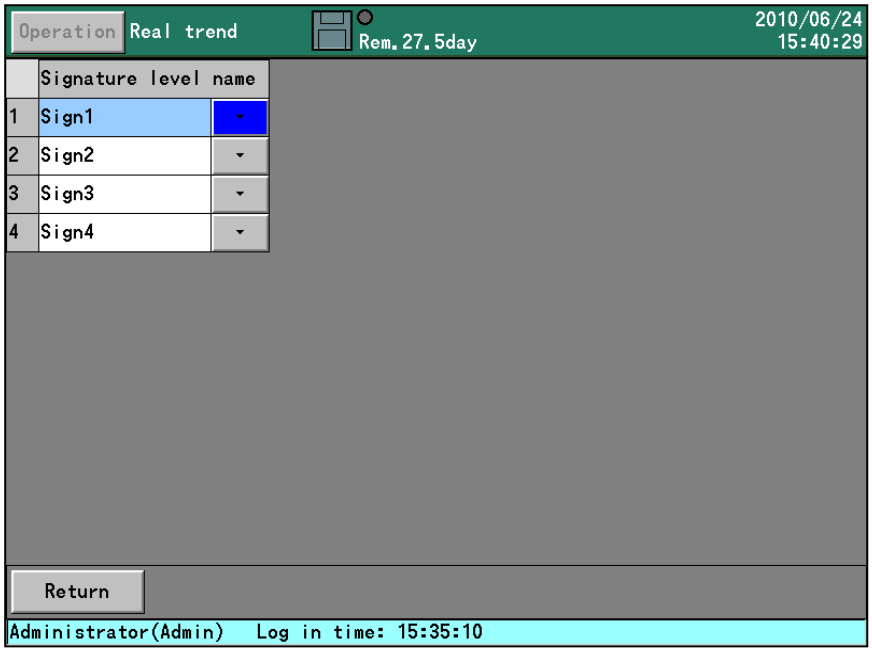


Password expire (day)	Set an expiration date for a password. When the expiration date has passed, you need to reset a password (set value: 0 to 400 days). ※ Set this item to “0” for an indefinite period.
Minimum password length	Set the minimum length of a password (0 to 10 characters).
Login timeout (min)	Set a time to execute an automatic logout (0 to 60 minutes). ※ Set this item to “0” for an indefinite period.
Login error (times)	Set the maximum limit of failed login attempt (0 to 20 times). If the maximum limit is exceeded, further login attempts by the user will be blocked (lock-out). To cancel lock-out, refer to “7.8 How to cancel lock-out”. ※ Set this item to “0” for an unlimited login attempt.
Login method	Select either “List” or “Key input” as a method for entering a user ID on the login screen. Selecting “List” displays a list of registered IDs.
Last ID display	Select “ON” or “OFF” whether to display the last login User ID to the ID entry field of login screen.

■Setting the signature

- On this screen, you can set a digital signature. To place a signature, refer to “9.2 Digital signature”.
- Four levels (1 to 4) of signature are available.

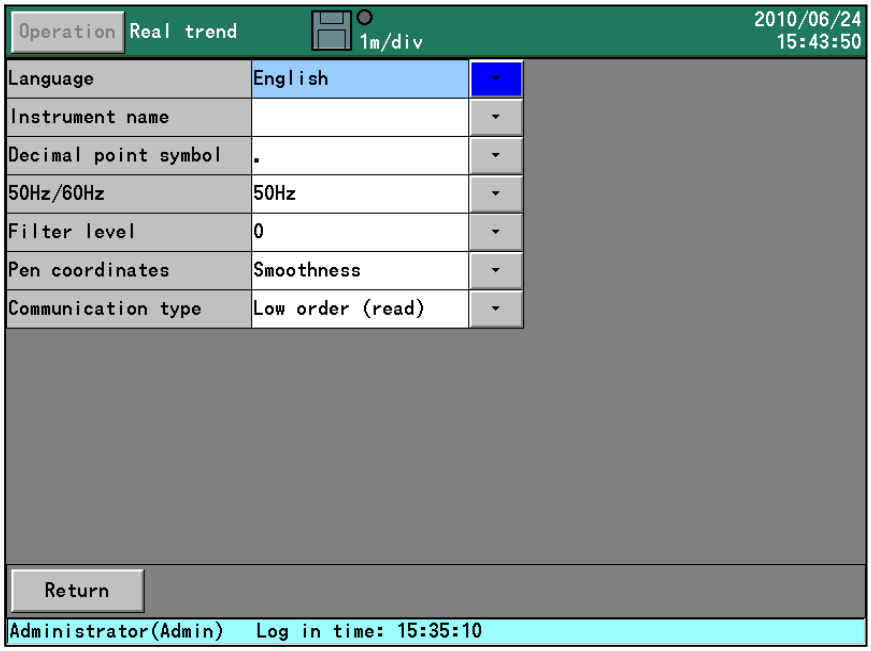
<Signature settings screen>



10.12.6 Other settings

- Tap [System settings] - [Other settings] in the setting menu to display the following screen.
- On this screen, you can configure various settings including the language used for this instrument, filter level, and communication type.

<Other settings screen>



■Selecting the language

- Select the language from Japanese or English.

■Setting the instrument name

- It is used in the subject for forwarding the e-mail. ” Message from (instrument name)” is used as the subject.
- When it is in blank, the subject becomes "Message from Recorder".

■Setting the decimal point symbol

- Select “. (dot)”, or “, (comma)” for the decimal point.

■Setting 50Hz/60Hz

- Select the power frequency from 50Hz or 60 Hz.

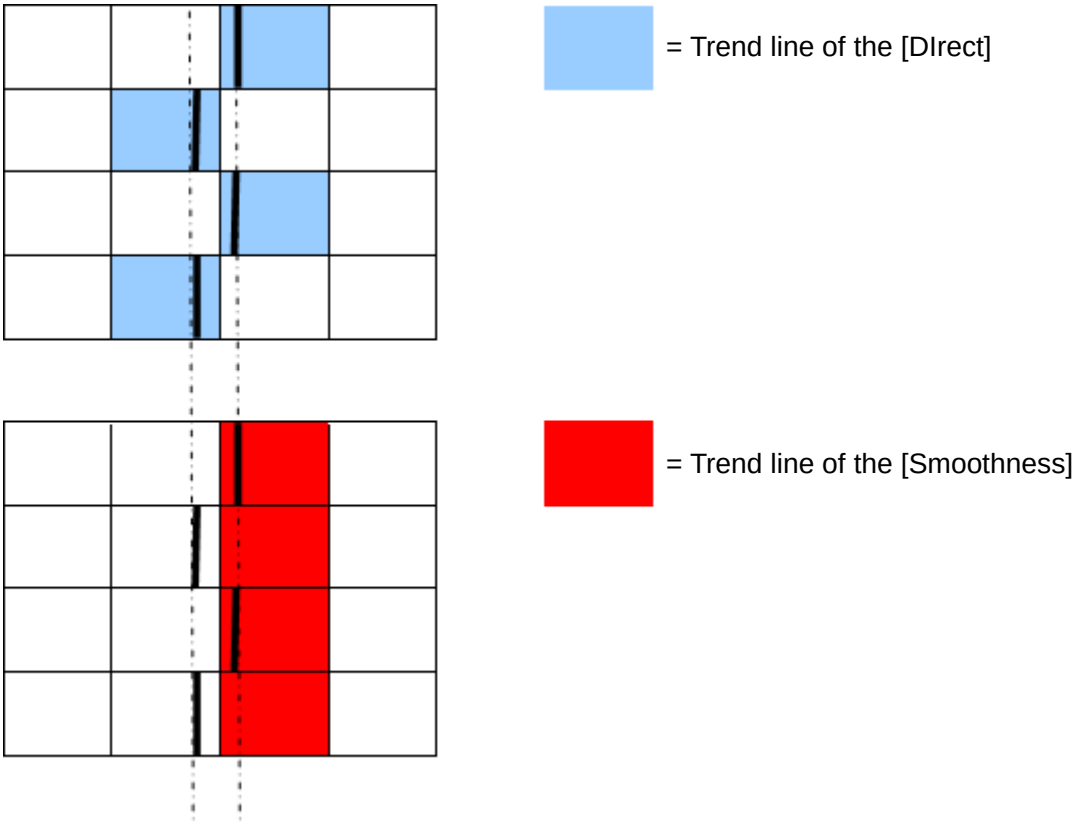
■Setting the filter level

- The input filter level can be set from 0 to 3.
- 0 means no-filter and 3 means the strongest filter.

■Setting the pen coordinate

- Select the coordinates calculation way of trend from smoothness/direct.
- In case of selecting the [Smoothness], even if the trend coordinate is changed by changed data, the trend coordinate is not changed from previous value until changing of the data exceed equivalent of 1 dot on the trend. When data is changed less than equivalent of 1 dot of trend coordinate, trend line does not swing.
- When select the [Direct], the trend coordinate from data is drawn directly.

(Example of drawing for [Direct] and [Smoothness])



■Setting the communication type (option)

- Select the communication type from [High order], [Low order (read)], or [Low order (write)].
- Each communication types are following.

High order	Use for the data acquisition, parameter setting and operation by instrument or computer that is connected high order.
Low order (read)	Record the data in PLC and input data of the product of our company that is connected low order.
Low order (write)	Transfer the input data of KR3000 to PLC.

11 Communication settings (option)

11.1 Low order communications (read)

11.1.1 Outline

※When use low order communications, set communications type to [Low order (read)] (refer to "10.12.6 Other settings").

- Low order communications are functions that this recorder works as a master unit (high order instrument) communications and reading data of the other instruments which are connected as slave units (low order instruments) assigned for input channel of this recorder and then displaying and recording the data. This recorder and low order instruments communicate by serial communication of RS-485 communication standard compliance.
- The "range", "scale", "RJ", and "burn out" settings can be set for lower order instrument.※1
- Data requirement for each instrument is approximately 1 second (all points per 1 instrument). ※2 When connect 5 instruments to low order side, data renewal period is approximately 5 seconds.※3

※1 LT230, LT350/370, LT830, JU, JW has only data collective function, not setting.

※2 Data renewal time is different depending on regulated points only JW.

Less than 10 points	: number of connection lower-order communication instrument x 1 (second)
10-13 points	: number of connection lower-order communication instrument x 2 (seconds)
More than 13 points	: number of connection lower-order communication instrument x 3 (seconds)

※3 Except JW

※4 Data of following PLC made of Mitsubishi Electric can be read.

- MELSEC AnACPU series
- MELSEC QnACPU series
- MELSEC QnASCPU series
- MELSEC QCPU series
- MELSEC FX series

Need the communication unit etc. that is corresponded communication control procedure model 4.

Following devices can be imported.

- D0000 to D1023
- M0000 to M2047

※5 The data of PLC made of Omron can be read.

- The instrument which is corresponded SYSMAC C mode command communication.

Following channels can be inputted.

- Data memory (DM) area: D0000 to D9999
- CIO (input and output relay etc.) area: 0 to 6143

When PLC of Omron communicate with RS-485, need line convertors (SC8-10) same as the number of PLC (refer to "4.7 (6) Connections of low order communication RS-422A" and "4.7 (7) Connections of low order communication RS-485"). When communicate with RS-422A, need communication unit that is corresponded high order link C mode command.

—Instrument can be connected low order side—

1. BR
2. AL3000
3. AH3000
4. SE3000
5. KE3000
6. LE5000
7. KR2000/3000
8. LT230
9. LT350/370
10. LT450/470
11. LT830
12. DB1000/2000
13. DP1000G
14. KR1000/2000
15. JU
16. JW
17. MELSEC series ※4
18. SYSMAC series ※5

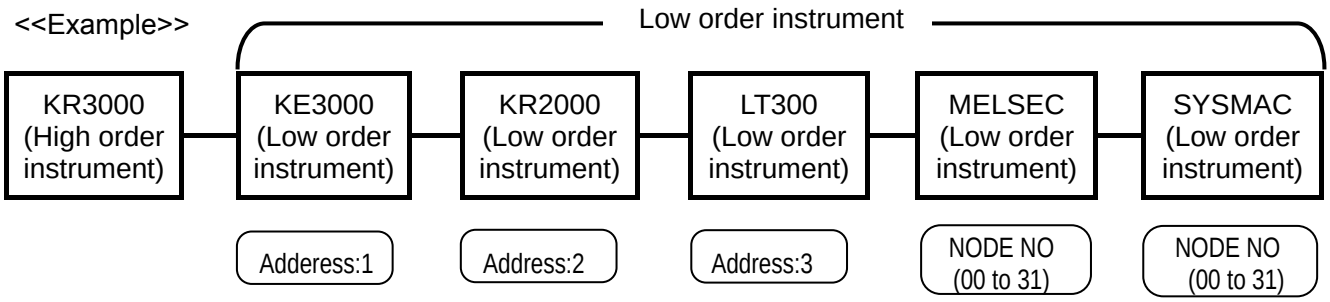
■Lower-order communication (read) outline

- Model:KR3P□□－S□□
- Connection quantity: Maximum 16
- Maximum reading points※: 120 to analog input points
  ※Possible to register on channel which has not input in the recorder.
- Data renewal period: approximately 1 second per 1 instrument.※
  ※Display of renewal may delay in this instrument depending on the condition of data renewal or communication response delay of low order side instrument.
- Communication time out: approximately 1 second for each instrument※ (no retry). Retain the data of last value.
  ※When communication time out is occur for the 60th times in a row, display and record "UNDER".

11.1.2 Procedure of connection setting to low order instrument

- After connecting between low order communication terminal of this recorder and low order instruments, set this recorder (high order instrument) and low order instruments following the procedure.
- For details of connection, refer to “4.7 Connection of communication I/F terminal” and the installation/connection manual of each device. (Terminal resistance is installed to the instrument which is set one end or both ends of standard communication line, however terminal resistance is not installed depend on the environment.)

<<Example>>



11.1.3 Setting of low order instrument

① Set communication address (instrument number) of low order instrument from 1 to 16 without overlap. (Node number of PLC is optional number which is not overlapping.)

② Set communication of each low order instrument by specification of below. See instruction manual of each instrument for setting method.

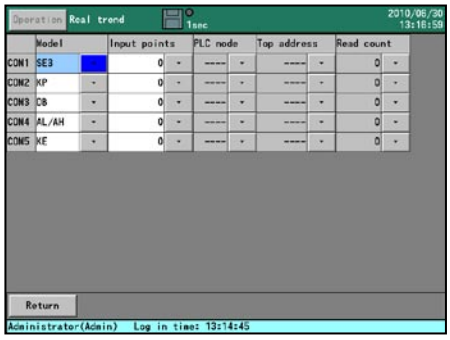
Baud rate	9600 bps
Length of data	8 bit
Stop bit	1 bit
Parity	None

11.1.4 Register to the instrument (product of our company)

① Press the Menu key in operation screen of the instrument, and select “system setting” → “low order communication (read)” in the list, then press the ENTER key. (Display “lower communication (read)” only in lower communication (read) option product)

② Select appropriate name of the model from a list of “model”. Register low order instrument corresponding each communication address (instrument number) 1 - 5 to COM1-COM16.

③ Register points to “input points”※2※3



◆ Example of setting
COM1:KE/60points
COM2:KR2/44points
COM3:LT3/1point
COM4: AL/6points
COM5: BR/4points

※1 Name of instrument which is displayed on the list is displayed convenient.

On the list	Model of our company
SE3	SE3000
AL/AH	AL3000/AH3000
KR2/3	KR2000/KR3000
LE5	LE5000
LT2/3/8	LT230/LT350/370/LT830
LT4	LT450/470
DB	DB1000/2000
DP-G	DP1000G
KP	KP1000/KP2000

※2 Data of LT (each series), JU, and JW is assigned like below for CH data.

JW	
CH01	Voltage level (average)
CH02	Current value (average)
CH03	Electric value
CH04	None assigned
CH05	Voltage level (between U phase and V phase)
CH06	Current value (U phase)
CH07	Load resistance value (U phase)
CH08	Voltage level (between V phase and W phase)
CH09	Current value (V phase)
CH10	Load resistance value (V phase)
CH11	Voltage level (between W phase and U phase)
CH12	Current value (W phase)
CH13	Load resistance value (W phase)
CH14	Initial resistance value (U phase)
CH15	Initial resistance value (V phase)
CH16	Initial resistance value (W phase)

JU	
CH01	Voltage level
CH02	Current value
CH03	Electric value
CH04	Load resistance value

※3 The data of LT, DB, and DP is allocated in KR3000 as CH data.

CH / Parameter		Model name						
		LT8	LT2	LT3	LT4	DB	DP-G	KP
CH01	PV	○	○	○	○	○	○	○
CH02	SV	○	○	○	○	○	○	○
CH03	MV1	○	○	○	○	○	○	○
CH04	MV2	○	○	○	○	○	○	○
CH05	Execution SV	×	○	○	○	○	○	○
CH06	EV1	×	○	○	○	○	○	○
CH07	EV2	×	○	○	○	○	○	○
CH08	EV3	×	×	○	○	○	○	○
CH09	EV4	×	×	×	○	○	○	○
CH10	P	×	○	○	○	○	○	○
CH11	I	×	○	○	○	○	○	○
CH12	D	×	○	○	○	○	○	○
CH13	Execution No.	×	○	○	○	○	×	×

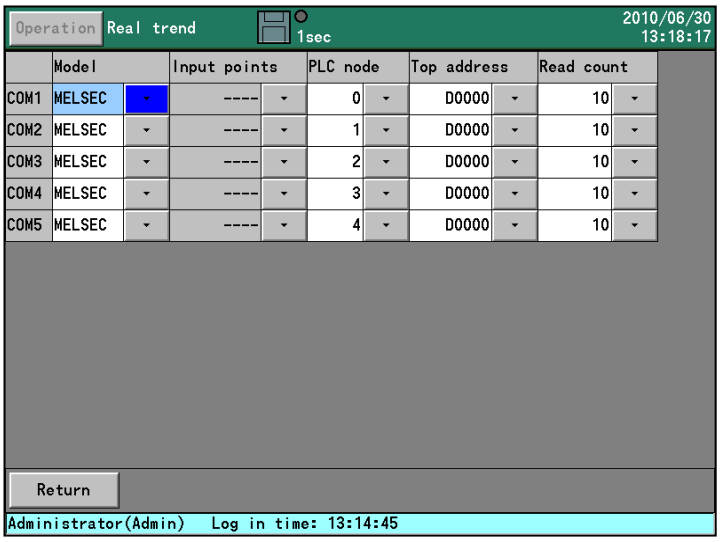
○ ：The display is possible. × ：UNDER display

11.1.5 Register to the instrument(PLC)

① Tap [System settings] - [Low order communication (read)] in the setting menu.
※“low order communication (read)” is displayed when the recorder has low order communication (read) option.

② Select the name of the model from the list of “model”. Then register PLC on each COM1 to COM5.

③ Register administrate address of the recorder on “top address” and “read address”.

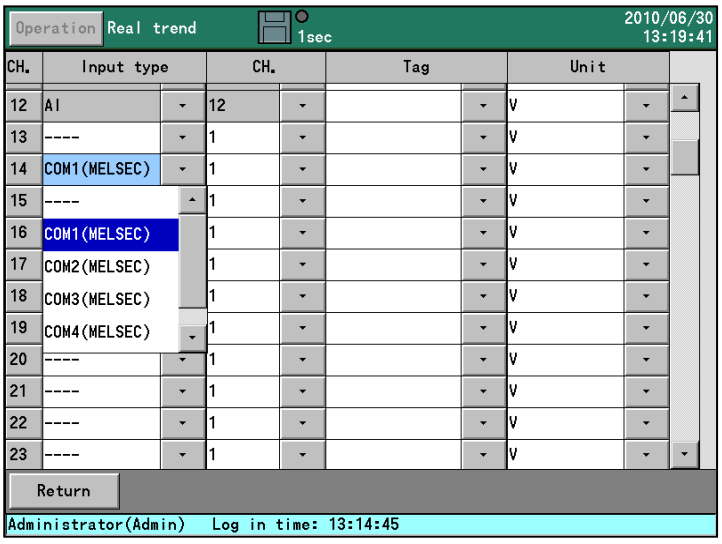


11.1.6 Register CH number of low order instrument

① Select [Input operation settings] from the setting menu.

② Tap the ▼ of “input type” of CH which is registered low order instrument.
Select the model registered in “11.1.4 Register to the instrument (product of our company)” and “11.1.5 Register to the instrument (PLC)” from the list.

③ Set CH number of low order instrument which is resisted “CH” column of third row.

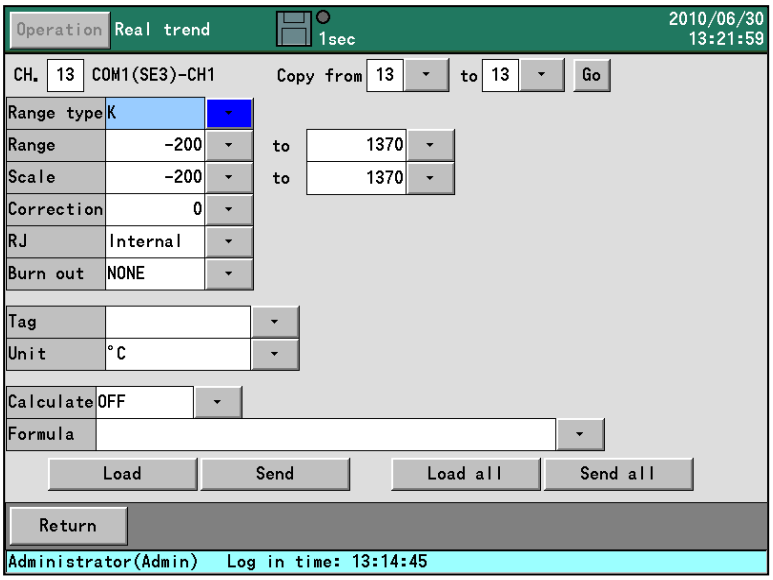


Remark About input setting of low order instrument

When a model that registers by the low order communication setting and an actual connected model have the difference, the selection item of the input kind of might not be normally displayed. Please use externals where there is no difference in connected model and the main body setting.

11.1.7 Input setting of low order instrument

① Tap “input computation programming” of “CH” of the left side.
Display detail setting screen like below.



② Tap the [Load] button to obtain the setting of the corresponding channel of low order device. To obtain the settings of all the registered channels, tap the [Load all] button.
Following message is shown when input of setting contents is done normally.

Tap the [OK] button to complete.
If the input is incorrect, the following message is displayed.

After tapping the [OK] button, tap the [Load] button again. When message of “INPUT Complete” is not shown, communication is not normal. Check the setting and connection of this instrument and low order instruments again.

③ When changing the setting from this recorder for appropriate CH of low order instrument, perform following procedure. (For the instrument which cannot change the settings, [Send] and [Send all] buttons are not displayed.)

Tap the [Send] button to change the setting of the displayed channel only. When you want to change the settings of some channels at a time, tap the [Send all] button after completing the setting changes. After sending contents of setting is complete, the following message is displayed.

Tap the [OK] button to complete.

If the input is incorrect, the following message is displayed.

After tapping the [OK] button, tap the [Send] button again. When message of “INPUT Complete” is not shown, communication is not normal. Check the setting and connection of this instrument and low order instruments again.

④ When you complete the settings of channels, tap the [Return] button to exit the setting screen and save the settings.

⑤ After setting of the above procedure, start data acquisition.

11.2 Low order communications (write)

11.2.1 Outline

※*When use low order communications, set communication type to [Low order (write)] (refer to "10.12.6 Other settings")

・ Low order communications (write) has the function that communicate for high order instrument and write measurement and calculation data of this recorder to connected low order instrument This recorder and a low order side instrument perform serial communication of RS-422A or RS-422A communication standard compliance.

—Instrument can be connected low order side—
1. MELSEC series※1
2. SYSMAC series※2

※1 Data of following PLC made of Mitsubishi Electric can be read.

- MELSEC AnACPU series
- MELSEC QnACPU series
- MELSEC QnASCPU series
- MELSEC QCPU series
- MELSEC FX series

Need the communication unit etc. that is corresponded communication control procedure model 4.

Following devices can be inputted.

- D0000 to D1023
- M0000 to M2047

※2 Data of following PLC made of Omron can be read.

- The instrument which is corresponded SYSMAC C mode command communication.

Following channels can be inputted.

- Data memory (DM) area: D0000 to D9999
- CIO (input and output relay etc.) area: 0 to 6143

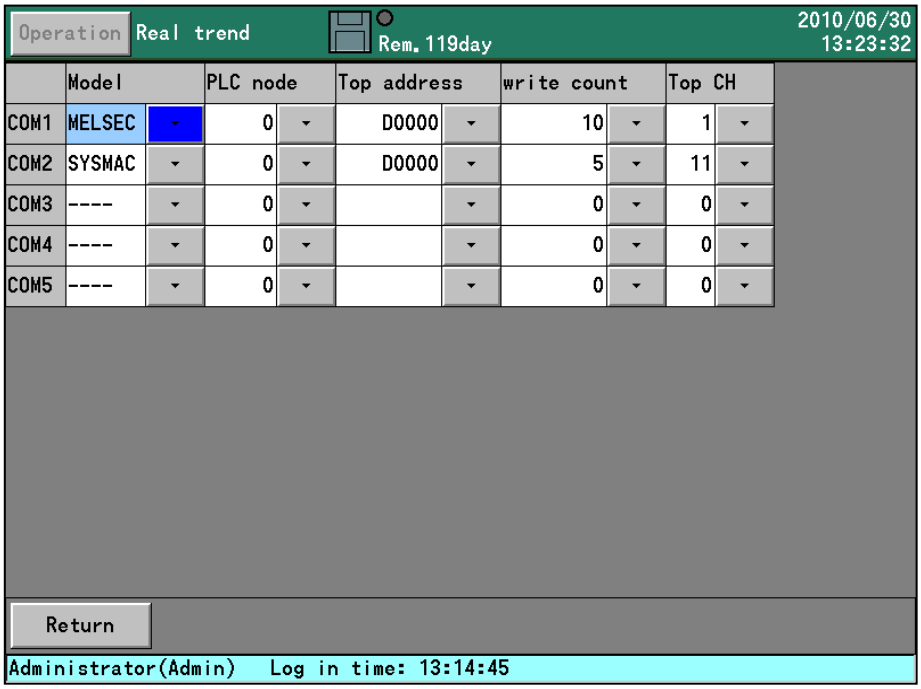
When communicate with PLC of Omron, need line convertors (SC8-10) same as the number of PLC (refer to "4.7 (6) Connections of low order communication RS-422A" and "4.7 (7) Connections of low order communication RS-485"). When communicate with RS-422A, need communication unit that is corresponded high order link C mode command.

■Low order communications (write) specification outline

- Model: KR3P□□-S□□
- Connection quantity: Maximum 5
- Maximum writing points※: 128
  ※Possible to write all channels data of this instrument.
- Data renewal period: Approximately 1 second per 1 instrument※
  ※Display of renewal may delay in this instrument depending on condition of data renewal or communication response delay of low order side instrument.
- Communication time out: Approximately 1 second for each instrument※(no retry).
  ※When the instrument includes communication time out and has communication error for 60th times, display error message.

11.2.2 Register to the instrument

① Select [System settings] - [Low order communication (write)] from the setting menu.
※“low order communication (write)” is displayed when the recorder has low order communication (write) option
② Select the name of the model from the list of “model”. Then register PLC on each COM1 to COM5.
③ Resister address which is written from this recorder on “top address” and “write count”.
④ Resister top channel of source of write on “top CH”.



On the setting of the above,
COM1: Write the data of CH1 to 10 of KR to “D0000 to D0009” of MELSAC of PLC node “0”.
COM2: Write the data of CH11 to 15 of KR to “D0000 to D0004” of SYSMAC of PLC node “0”.

12 Scale calibration

To maintain the measurement accuracy, it is recommended to calibrate this recorder every year.

Calibration name	Description
Zero/span adjustment	Execute the adjustment by inputting the zero and span of each measurement range. * As for this recorder, the AD converter and one KR3P*1 every four channels do the input process to KR3P*0 with one AD converter every twelve channels. Therefore, KR3P*1 inputs and adjusts zero and the span of each range of each input terminal unit of each input terminal unit three times once to KR3P*0.

※ The sensor correction (shift of value) for each channel can also be performed. (Refer to “10.3 Input operation settings”)

12.1 Adjustment environment

Items	Reference conditions
Ambient temperature	23°C±2°C
Ambient humidity	50%±10%
Power voltage	100VAC±１%
Power frequency	50Hz or 60Hz±0.5%

12.2 Preparation of tools

Tools	Input types			Remarks
	DC voltage	Thermocouple	DC voltage	Thermocouple
DC voltage current generator	○			Accuracy: Better than ±0.05%
Reference junction compensator		○		0°C±0.2°C
Thermocouple for test		○		Same type of thermocouple as the input
Standard variable resistor			○	Accuracy: Better than ±0.05%
3-core copper wire			○	Same resistance value per core

12.3 Before calibration

①Attach the terminal board cover and turn the power on.
②Take the warm-up time for more than 30 minutes until this recorder stabilizes. (The ideal warm-up period is more than 1 hour.)

Remarks About adjustment

The check and adjustment of measured values need careful cautions for the adjustment work besides tools such as standard tools and reference conditions.
When the check and adjustment of measured values are required, contact your local CHINO’s sales agent.

12.4 Connections

Connections depend upon the input types. Connect tools such as standard tools to the measuring input terminals to be adjusted.

⚠ Caution

■Turn off the power source before connections

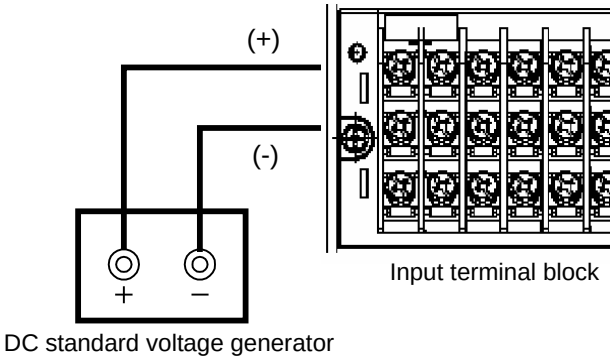
Turn off the power source before connections for preventing electric shock.

<For KR3P＊0>

① In case of the DC voltage input

The 2nd, 5th and 11th terminals of each input terminal unit are the terminals for adjustment.
For the adjustment, connect to the 2nd, 5th and 11th terminals all together as shown in the right figure.

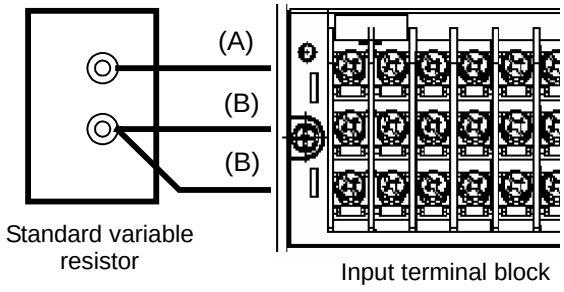
The 1st-4th terminals, 5th-8th terminals and 9th-12th terminals are adjusted through the 2th, 5th and 11th terminals respectively.



②In case of the resistance thermometer input

The 2nd, 5th and 11th terminals of each input terminal unit are used for adjustment.
For the adjustment, connect to the 2nd, 5th and 11th terminals independently as shown in the right figure.

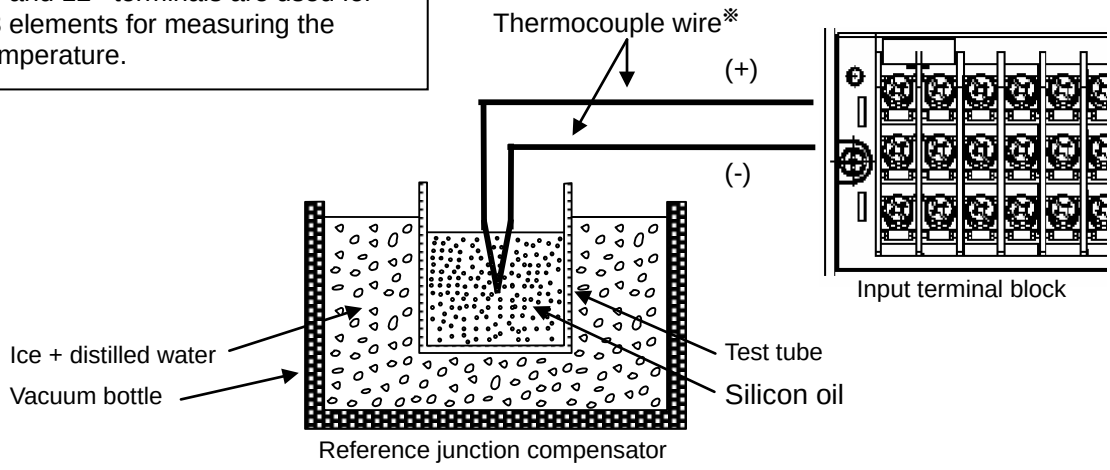
The 1st-4th terminals, 5th-8th terminals and 9th-12th terminals are adjusted through the 2th, 5th and 11th terminals respectively.



③In case of the thermocouple input

The 1st, 6th and 12th terminals on each input terminal unit are used for adjustment.
To adjust the thermocouple, connect to the 1st, 6th and 12th terminals as shown in the below figure.

■The 1st, 6th and 12th terminals are used for adjusting 3 elements for measuring the terminal temperature.



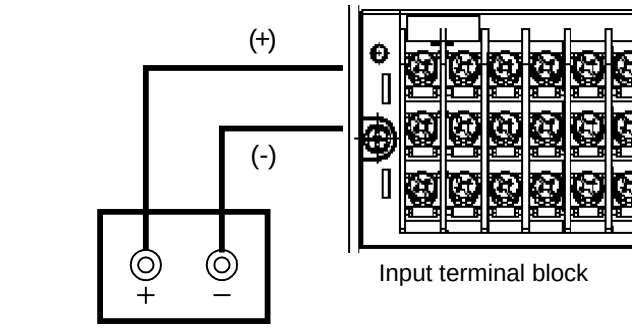
※The electromotive force of the thermocouple input becomes small by the electromotive force equivalent to the temperature at terminals. The instrument itself compensates for its value. This is called the reference junction compensation. The input for the adjustment is entered with the reference electromotive force (0°C at reference). Accordingly, the reference junction compensator is used for reducing the reference junction compensated value.

<For KR3P∗1>

①In case of the DC voltage input

The 2nd terminal of each input terminal unit is for the terminal for adjustment.
To perform an adjustment, connect to the terminal 2 as shown in the right figure.

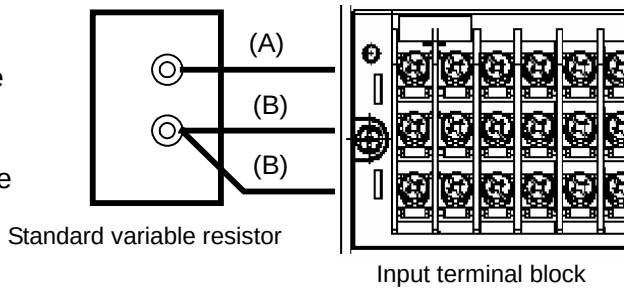
All terminals of its unit are adjusted by the adjustment of the 2nd terminal.



②In case of the resistance thermometer input

The 2nd terminal of each input terminal unit is for the terminal for adjustment.
To perform an adjustment, connect to the terminal 2 as shown in the right figure.

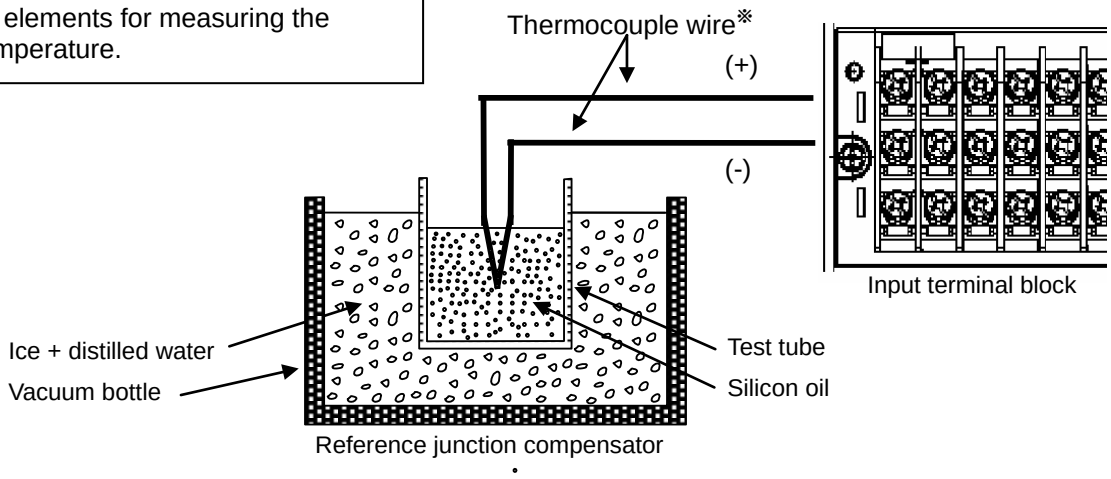
All terminals of its unit are adjusted by the adjustment of the 2nd terminal.



③In case of the thermocouple input

The 1st, 6th and 12th terminals of each input terminal unit are the terminals for adjustment.
To adjust the thermocouple, connect to the terminal 1, 6, and 12 as shown in the below figure.

■The 1st, 6th and 12th terminals are used for adjusting 3 elements for measuring the terminal temperature.

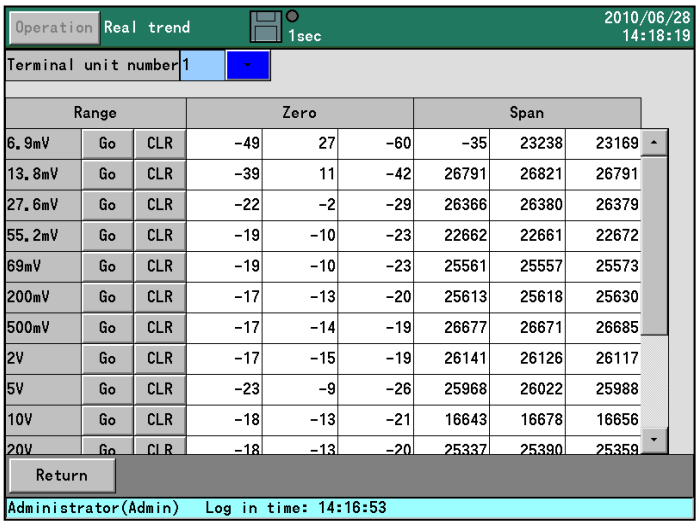


※The electromotive force of the thermocouple input becomes small by the electromotive force equivalent to the temperature at terminals. The instrument itself compensates for its value. This is called the reference junction compensation. The input for the adjustment is entered with the reference electromotive force (0°C at reference). Accordingly, the reference junction compensator is used for reducing the reference junction compensated value.

12.5 Adjustment method (Zero and span adjustment)

- On the operation screen, tap the [Operation] button and select [MENU settings] - [System settings] - [Scale adjustment] to display the following adjustment screen.
- On this screen, you can perform a scale adjustment for each input channel. The zero and span points of the input range are input to the each channel used for adjustment. Tapping the [Go] button beside the range you want to adjust enters the adjustment mode.
- The data displayed show the AD account values after adjustment.

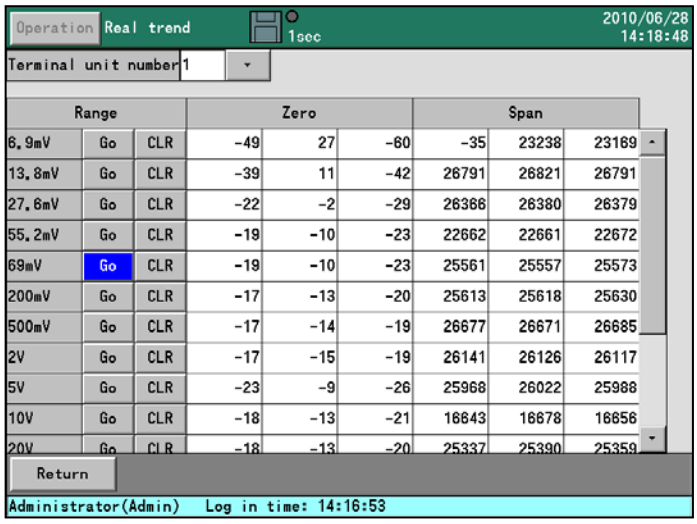
<Zero/span adjustment screen>



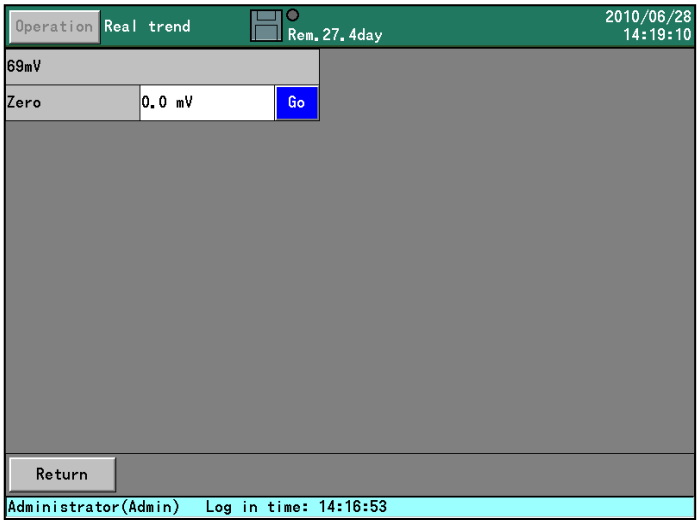
[Adjustment of the DC voltage input range]

Connect as shown in “12.4 Connection (1) In case of the DC voltage input”. Execute the adjustment by inputting the voltage for the adjustment range.

①Tap the [Go] button beside the range you want to adjust.



②Since the window indicating the voltage value for inputting is displayed, input its value to this recorder.



③Adjust the zero point.

(Example) For the adjustment of the ±69mV range

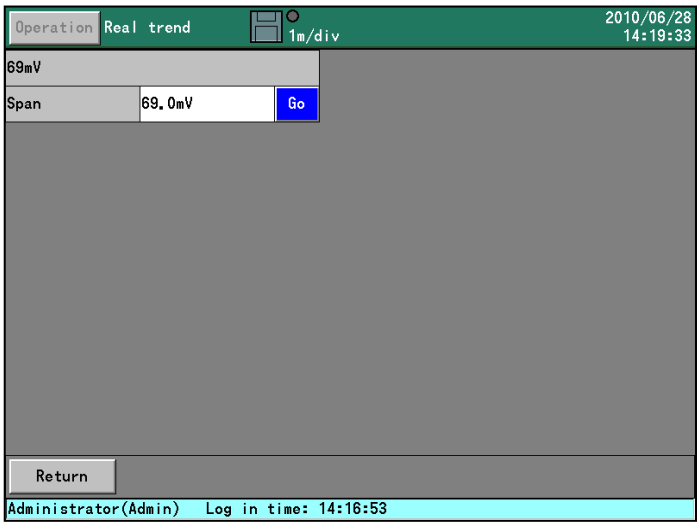
- Input the voltage of 0V with the DC standard voltage generator.

④Input the zero point for approx. 5 seconds and then tap the [Go] button.

⑤Adjust the span point.

(Example) For the adjustment of the ±69mV range

- Input the voltage of +69mV with the DC standard voltage generator.



⑥Input the span point for approx. 5 seconds and then tap the [Go] button.

⑦After the adjustment of the span point, the screen is returned to the calibration screen for all ranges.

⑧Repeat from (1) to (6) for the adjustment of other ranges.

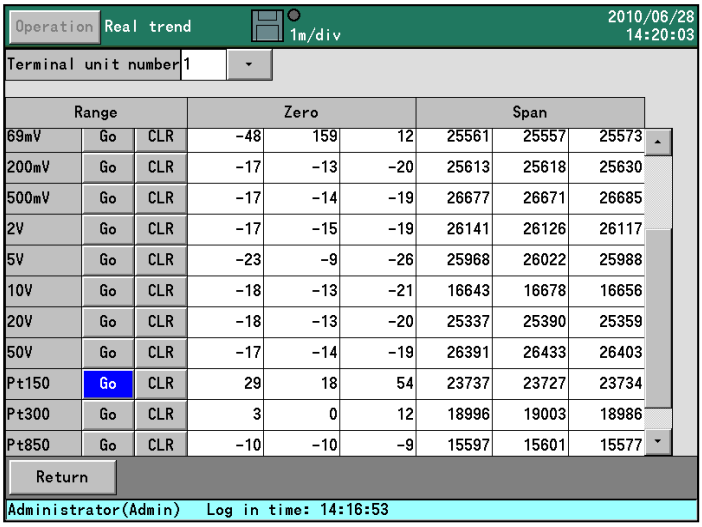
⑨When you complete the adjustment, tap the [Return] button twice to return to the setting menu screen.

[Adjustment of the resistance thermometer input range]

Connect as shown in “12.4 Connection (2) In case of the resistance thermometer input”. Execute the adjustment by inputting the resistance value for the adjustment range.

<How to set>

①Tap the “Go” button at the range to be adjusted.

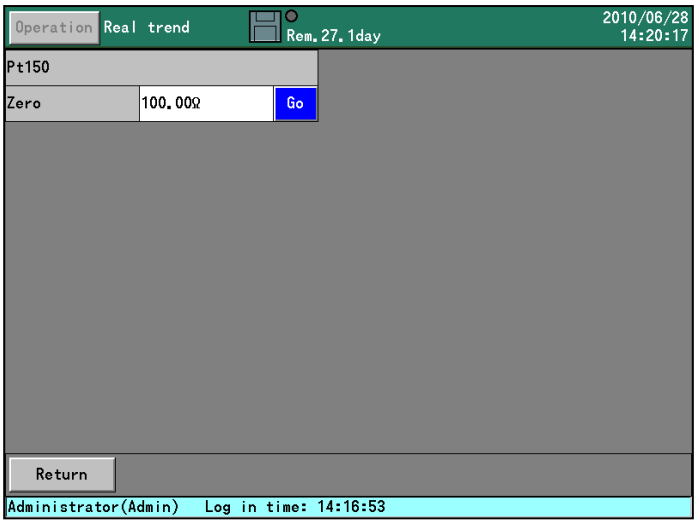


②Since the window indicating the resistance value for inputting is displayed, input its value to this recorder.

③Adjust the zero point.

(Example) For the adjustment of the Pt150 range

- Input the resistance of 100Ω with the standard variable resistor.

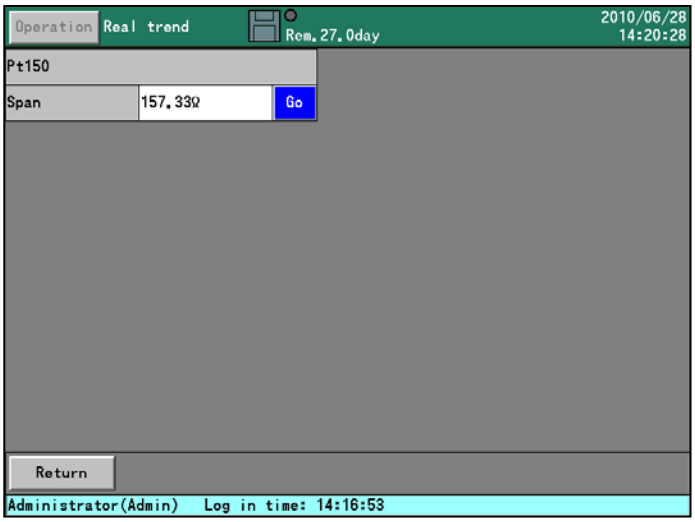


④Input the zero point for approx. 5 seconds and then tap the [Go] button.

⑤Adjust the span point.

(Example) For the adjustment of the Pt150 range

• Input the resistance of 157.33Ω with the standard variable resistor.



⑥Input the span point for approx. 5 seconds and then tap the [Go] button.

⑦After the adjustment of the span point, the screen is returned to the calibration screen for all ranges.

⑧Repeat from (1) to (6) for the adjustment of other ranges.

⑨When you complete the adjustment, tap the [Return] button twice to return to the setting menu screen.

※When the channel to be calibrated is kept being open, the adjustment at this channel is not performed.

[Adjustment of the thermocouple input range ･･･ Adjustment of the reference junction compensation (RJ at 0°C)]

Remarks

After the adjustment of the DC voltage input range, execute the adjustment of the thermocouple input range. If the adjustment of the DC voltage input range is performed after the adjustment of the thermocouple input range, the adjustment results are influenced.

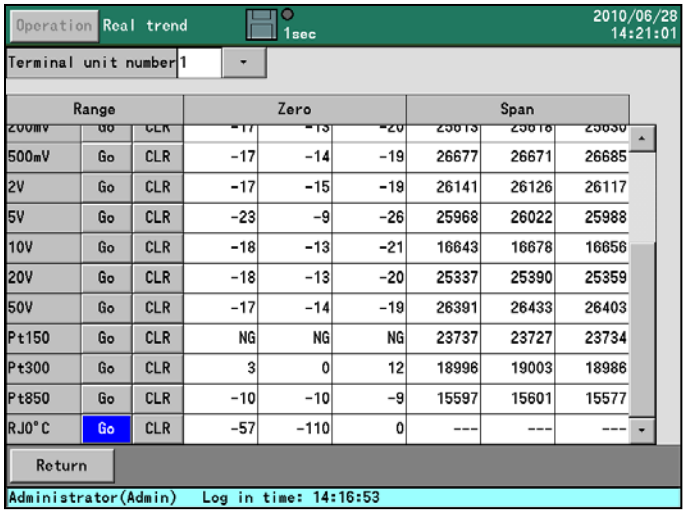
Connect as shown in “12.4 Connection (3) In case of the thermocouple input”. Execute the adjustment by connecting the thermocouple for adjusting to each of the 1st, 6th and 12th terminals.

<How to set>

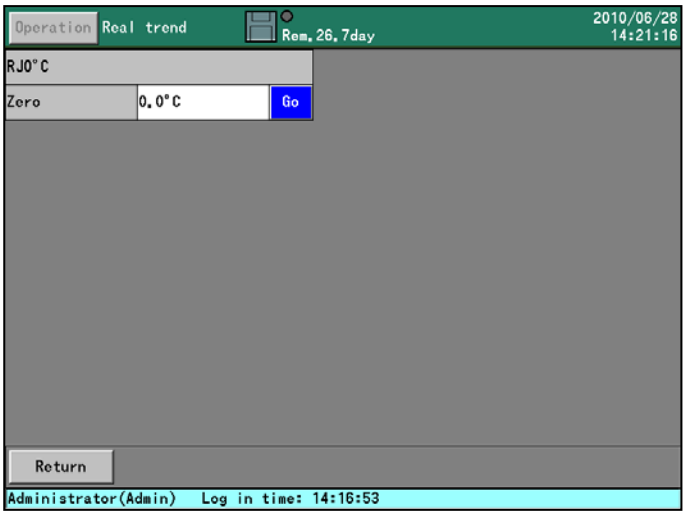
①Before moving to the calibration screen, set the input of the 1st, 6th and 12th terminals to the followings.
(Refer to “10.3.1 Setting contents”.)

Range type	Thermocouple connected
Range	Set 1 for the decimal point position of the range setting value. Recommendation: Measuring range of which the reference range is ±13.8mV and the display resolution becomes 0.1°C (Refer to “15 Specifications ○Measuring Range, Accuracy Rating and Display Resolution”.)
RJ	Internal
Burn out	None

②Tap the [Go] button beside the RJ0°C range on the adjustment screen.



③Tap the [Go] button after approx. 30 seconds.



④After the adjustment, the screen is returned to the calibration screen for all ranges.

⑤When you complete the adjustment, tap the [Return] button twice to return to the setting menu screen.

Remarks

■ When the input to this recorder was wrong or some inconvenience occurred, try to execute the scale calibration again.
■ When the [CLR] button is tapped on the adjustment screen, the adjustment data will be cleared and the factory default will be restored.

13 Guideline of parts replacement interval

It is recommended to exchange parts periodically as preventive maintenance for using this recorder under good conditions for a long time

⚠Warning

For replacing parts, ask the service personnel authorized by CHINO. Otherwise, this instrument may not recover properly and also accident may occur.
Contact your local CHINO's sales agent to perform parts replacement.

[Operating conditions]

The reference of the parts exchange intervals is under the following standard conditions. The intervals become shorter if environmental conditions are worse than the standard conditions.

Items	Conditions
Temperature	20 to 25°C
Humidity	20 to 80%RH
Operation time	8 hours/day
Corrosive gas	Not existed

Items	Conditions
Others	1) A place without dust, moisture or oily smoke 2) A place without vibrations or shocks 3) A place where the operation is not adversely affected

[Reference of parts exchange intervals]

Part name	Reference of exchange	Remarks
Power supply unit	5 years	At the ambient temperature of 25°C
LCD	5 years	※
Key	5 years	
Relay (For mechanical alarm output)	70,000 times	Resistance load (Less than the rated contact rating)
	20,000 times	Inductive load (Less than the rated contact rating)
Lithium battery	5 years	

※When the LCD reduces its brightness to half, exchange it. The reduction of brightness differs depending on the usage conditions.
The replacement interval can be extended by using the screen saver function(display off timer) or by setting the brightness control small(refer to "10.4.5 LCD settings").

14 Troubleshooting

Troubleshooting methods are shown by symptoms. Read corresponding symptom items.

1. Not working

Check	Causes and remedial measures
1) Check if power is supplied to power terminals	Turn ON the external source power supply.
2) Check if the power supply is as specified	Feed power supply as specified (100 to 240 VAC 50/60Hz).
3) Check if connections to power terminals are correct.	Connect the cable to power terminals (L, N) correctly.
4) POWER switch is not turned ON.	Turn ON the POWER switch.
5) Try turning OFF and ON the external source power supply.	

2. Abnormal measurement

Symptoms	Causes and remedial measures
1) Measured values unstable	●Check measuring terminals for looseness. ●Check if the input signal is unstable.
2) An error occurs	●Check if the input signal is correct. ●Check if extension wire is connected to input terminals. (Thermocouple input only) ●Check input value, if error found, perform calibration with reference to Adjustment (refer to “ 12 Scale calibration”)..
3) Influences by ambient temperature (Thermocouple input only)	●Check if the terminal cover is mounted

When problem cannot be solved

If problem cannot be solved by performing the troubleshooting, contact your sales agent or CHINO with information of
1. Model, 2. Serial No., 3. Description of problem, 4. Other notes.
When repair of the instrument is needed, understand the following before having it repaired.
The data of internal memory may be deleted during repairing for unexpected trouble.
Backup the data to USB memory before having the instrument repaired. We are not responsible for the lost or damaged data.

15 Specifications

■General specifications

Rated power voltage: 100-240 VAC, 50/60 Hz
(Universal power supply)

Power consumption: 65VA MAX

Operating conditions:
・Reference operating condition
…Ambient temperature/humidity range
21 to 25ºC 45 to 65%RH
Power voltage 100VAC ±1%
Power frequency 50/60Hz ± 0.5%
Attitude Left/Right 0° Forward tilting 0° Backward tilting 0°
Warm-up time: 30 minutes or more
・Normal operating condition
… Ambient temperature/humidity range
0 to 50ºC, 20 to 80%RH
Power voltage 90 to 264VAC
Power frequency 50/60Hz ± 2%
Attitude Left/right 0° Forward tilting 0°
Backward tilting 0 to 20°
・Transportation condition,
… In the packed condition for shipment from the factory
Ambient temperature/humidity range
-20 to +60ºC, 5 to 90%RH (no dew condensation)
Vibrations 10 to 60Hz, 0.5G or less
Impact 40G or less
・Storage condition,
… Ambient temperature/humidity range
-20 to 60ºC, 5 to 90% RH (no dew condensation)

Power failure protection:
Settings are stored by FLASH memory and SRAM.
Data are stored by FLASH memory.
RAM for clock and parameters are backed up by a lithium battery for more than 5 years. (Provided that the daily operating hours is 8 hours or more)

Insulation resistance:
Between secondary and protective conductor terminals
…… More than 20MΩ at 500VDC
Between primary and protective conductor terminals
…… More than 20MΩ at 500VDC
Between primary and secondary terminals
…… More than 20MΩ at 500VDC
Between alarm output (mechanical relay) and other secondary terminals
……More than 20MΩ at 500VDC

Dielectric strength:
Between secondary and protective conductor terminals
…… 1 minute at 500VAC
Between primary and protective conductor terminals
…… 1 minute at 1500VAC
Between primary and secondary terminals
…… 1 minute at 2300VAC
**Primary terminals: Power terminals(L, N), alarm output terminals
Secondary terminals: Input terminals, digital input terminals, communication terminals

Case assembly material: Door flame……ABS resin
Case and power supply part…… Steel
Color: Door frame…… Black (Equivalent to Munsell N3.0),
Case……Gray (Equivalent to Munsell N7.0)
Weight: Approx. 7.2kg (48 points input with full options)
Outside dimensions: 288H x 288W x 247.5D (250.7D with communication, alarm and digital input options)
Panel-cut dimensions: 281 x 281
Mounting: Panel mounting
Clock accuracy: ±2 minutes per 30 days (excluding errors due to power ON/OFF under the reference operating conditions.)

Terminal screws: Power terminal……M4.0
Protective conductor terminal……M4.0
Input terminals……M3.5
Alarm output terminals……M3.5
Digital input terminal……M3.5
Communication terminals……M4.0

■Standards

CE marking: *Only the CE corresponding model applies.
EMC directive EN61326-1 Class A
EN61000-3-2
EN61000-3-3
Low voltage directive EN61010-1
・Overvoltage(Installation) category Ⅱ
・Pollution degree2
・Measurement category Ⅱ
IP: IEC529 IP54 (front part) compliance
*The indication equivalent to 1mV may vary under the test environment by EMC directives.

■Input specifications

Measuring points: 12 points, 24 points, 36 points, 48 points
Input types: Universal input
DC voltage… ±13.8mV, ±27.6mV, ±69.0mV, ±200mV, ±500mV, ±2V, ±5V*, ±10V*, ±20V*, ±50V*
(* With built-in voltage dividing resistors)
DC current… Available by adding shunt resistors externally
T/C… B, R, S, K, E, J, T, N, NiMo-Ni, CR-AuFe, PtRh40-PtRh20, WRe5-WRe26, W-WRe26, Platinel II, U, L
RTD… Pt100, JPt100, Pt50, Pt-Co

Range setup: Setting of input types and ranges by key operation
The measuring range is selected automatically according to the setting range.

Scale setup: Setting of minimum values, maximum values and engineering units by key operation

Accuracy rating: Refer to the table of measurement range/ accuracy rating/display resolution.

Temperature drift: ±0.01% of full scale/°C [Other input types than the resistance thermometer inputs are converted into the reference range (Refer to the accuracy rating table.).]

Sampling rate: KR3P□0… About 100ms/48 points
KR3P□1… About 1 second/48 points
Reference junction (RJ) compensation accuracy:
K, E, J, T, N, Platinel II … ±0.5ºC or less
R, S, NiMo-Ni, CR-AuFe, WRe5-WRe26, W-WRe26, U, L … ±1.0ºC or less
(The above errors are added to the accuracy ratings for the internal reference junction compensation)

Input resolution: Approx. 1/32000 (converted into reference range)

Burnout: Input signal disconnection detection for thermocouple and resistance thermometer inputs. Up-scale burnout, down-scale burnout or burnout disabled can be selected for each input.

Allowable signal source resistance:
Thermocouple inputs (burnout disabled), DC voltage inputs (±2V or less) .... 1KΩ or less
DC voltage inputs (±5 to 50V) ... 100Ω or less
Resistance thermometer inputs (Pt100, JPt100)
… Less than10Ω per wire -- common to 3 wires

Input resistance:
Thermocouple input…Approx. 1MΩ
DC voltage input…… ±2V or less: Approx. 1MΩ
±5V to ±50V: Approx. 1MΩ

Maximum input voltage:
Thermocouple inputs (burnout disabled),
DC voltage inputs (±2V or less) Maximum ±10VDC
DC voltage inputs (±5 to ±50V) Maximum ±60VDC
Thermocouple inputs (burnout enabled),
Resistance thermometer inputs Maximum ±6VDC

Maximum common mode voltage: 30VAC

Dielectric strength between channels:
1000V AC or more between each channel
High strength semiconductor relay used
(B terminal of resistance thermometer is shorted inside between channels)

Common mode rejection ratio: 120dB or more (50 or 60Hz)

Series mode rejection ratio: 50dB or more (50 or 60Hz)
However, the peak value of the noise including signal should be equal to or less than 1.5 times the reference range.

■Recording specifications

Internal memory: 512 MB (standard specification)

Recording cycle:

Second	0.1, 0.2, 0.5, 1, 2, 3, 5, 10, 15, 20, 30 sec
Minute	1, 2, 3, 5, 10, 15, 20, 30, 60 min

Recording data:
Measured data
・Measured data …Registered name, recording start date/time, recording cycle, measured data, alarm data, maker text
・Setting parameters … All parameters

Recording measured data: 4-byte binary/1 data
(For recording maximum and minimum values - 6 byte/1 data)

Recoding into internal memory:
* The following conditions can be selected by key settings.
・Key operations
・Trigger signals (alarm activation)
・Start/end by day and time
* Pre-triggering is available in the key operations and trigger signals.
Pre-triggering measurement count =950 data
* Storage channel and recording cycle are set for each file.

Memory usage display:
The amount of memory used in each file is displayed on the operation screen by the icon.

External memory: USB flash memory
(FAT16, FAT32 formatted)
※ Operation of all USB flash memories is not guaranteed.

■Display specifications

Display: 12.1-inch TFT color LCD (800 x 600 dots 246.0mmX184.5mm)

Trend display colors: 48 colors (selectable)

Operation screens:
Screens are switched with tapping, the DISP key, Left/right/up/down arrow key, or the ENTER key.
・Trend screens…One of the real-time trend, historical trend or dual trend displays can be selected. (Scale plate and pointer displays) vertical or horizontal orientation is selectable. Data display enabled or disabled is selectable. Scrolling is available.
・Bar graph screen…Data display enabled or disabled is selectable.
・Data screen… (Data + Tag + Engineering unit + Alarm activation status)
・Alarm summary screen… Current alarm output status + alarm log (Channel, level, alarm activation/ cancellation time)

Skip function: On the trend and data screens, the channels to be skipped in display can be set for each group.

Scroll function: On the historical trend screens, previous data can be referred with the cursor operation.
・Historical trends…Entire memory file area
・Dual Trend…Historical trends are only available.

Replay function (historical trend): Historical data is displayed by specifying a file.
* Replay by the scroll function or by time specified

Data search (historical trend):
Historical trend display by selecting from the alarm display or the marker list

Marker display: Markers can be displayed on the trends record by the key operation or by digital input, and stored in the measured data file.
Display and storage on the historical trends are enabled.
＊ Pre-registration of marker text is enabled.
(Maximum 50 texts, maximum 30 characters/text)

Display updating interval: Same as storing interval

LCD saver: When no key is operated for the specified period of time, the backlight goes off. The period can be set from 1-60 minutes.

■ Setting/operation specifications

Operation method: Touch panel operation or exclusive keys operation

Key: 14 keys

START STOP SCROLL
CURSOR MARKER DISP
HOME MENU ESC ENTER

Direction key: right, left, up, down

Touch panel specifications
Type: Analog resistive-film type
Chemical resistance: Toluene, trichloroethylene, acetone, alcohol, gasoline, machine oil, ammonium water, glass cleaner, mayonnaise, ketchup, wine, salad oil, vinegar, lipstick, etc.

■Alarm specifications

Number of alarms: Up to 4 alarms/channel

Alarm types: High limit, low limit, differential high limit and differential low limit, Error

Alarm memory: Alarm activation/cancellation time and alarm types are stored.
＊ Storage of latest 200 data for all channels

Alarm output (Option): 24 points
12 points (‘a’ contact)
6 points (‘c’ contact)

○ Measurement ranges, Accuracy ratings and Display resolutions

Note) For the accuracy under the reference operation condition and for thermocouple inputs (internal RJ), the reference junction compensation accuracy is not included.

Input type		Measurement range	Reference range	Accuracy rating	Display resolution
Thermocouple	K	-200.0 to 300.0 °C	±13.8 mV	±0.1% ±1digit	0.1 °C
		-200.0 to 600.0 °C	±27.6 mV		0.1 °C
		-200 to 1370 °C	±69.0 mV		1 °C
	E	-200.0 to 200.0 °C	±13.8 mV		0.1 °C
		-200.0 to 350.0 °C	±27.6 mV		0.1 °C
		-200 to 900 °C	±69.0 mV		1 °C
	J	-200.0 to 250.0 °C	±13.8 mV		0.1 °C
		-200.0 to 500.0 °C	±27.6 mV		0.1 °C
		-200 to 1200 °C	±69.0 mV		1 °C
	T	-200.0 to 250.0 °C	±13.8 mV		0.1 °C
		-200.0 to 400.0 °C	±27.6 mV		0.1 °C
	R	0 to 1200 °C	±13.8 mV		1 °C
		0 to 1760 °C	±27.6 mV		1 °C
	S	0 to 1300 °C	±13.8 mV		1 °C
		0 to 1760 °C	±27.6 mV		1 °C
	B	0 to 1820 °C	±13.8 mV		1 °C
	N	-200.0 to 400.0 °C	±13.8 mV	±0.15% ±1digit	0.1 °C
		-200.0 to 750.0 °C	±27.6 mV		0.1 °C
		-200 to 1300 °C	±69.0 mV		1 °C
	W-WRe26	0 to 2315 °C	±69.0 mV		1 °C
	WRe5-WRe26	0 to 2315 °C	±69.0 mV	±0.2% ±1digit	1 °C
	PtRh40-PtRh20	0 to 1888 °C	±13.8 mV		1 °C
	NiMo-Ni	-50.0 to 290.0 °C	±13.8 mV		0.1 °C
		-50.0 to 600.0 °C	±27.6 mV		0.1 °C
		-50 to 1310 °C	±69.0 mV		1 °C
	CR-AuFe	0.0 to 280.0 °C	±13.8 mV		0.1 °C
	Platinel II	0.0 to 350.0 °C	±13.8 mV	±0.15% ±1digit	0.1 °C
		0.0 to 650.0 °C	±27.6 mV		0.1 °C
		0 to 1395 °C	±69.0 mV		1 °C
	U	-200.0 to 250.0 °C	±13.8 mV		0.1 °C
		-200.0 to 500.0 °C	±27.6 mV		0.1 °C
		-200.0 to 600.0 °C	±69.0 mV		0.1 °C
	L	-200.0 to 250.0 °C	±13.8 mV	±0.1% ±1digit	0.1 °C
		-200.0 to 500.0 °C	±27.6 mV		0.1 °C
		-200 to 900 °C	±69.0 mV		1 °C

Input type		Measuring range	Reference range	Accuracy rating	Display resolution
DC Voltage		-13.80 to 13.80 mV	±13.8 mV	±0.1% ±1digit	10 μV
		-27.60 to 27.60 mV	±27.6 mV		10 μV
		-69.00 to 69.00 mV	±69.0 mV		10 μV
		-200.0 to 200.0 mV	±200.0 mV		100 μV
		-500.0 to 500.0 mV	±500.0 mV		100 μV
		-2.000 to 2.000 V	±2 V		1 mV
		-5.000 to 5.000 V	±5 V		1 mV
		-10.00 to 10.00 V	±10 V		10 mV
		-20.00 to 20.00 V	±20 V		10 mV
		-50.00 to 50.00 V	±50 V		10 mV
Resistance thermometer	Pt100	-140.0 to 150.0 °C	160 Ω	±0.15% ±1digit	0.1 °C
		-200.0 to 300.0 °C	220 Ω	±0.1% ±1digit	0.1 °C
		-200.0 to 850.0 °C	400 Ω		0.1 °C
	JPt 100	-140.0 to 150.0 °C	160 Ω	±0.15% ±1digit	0.1 °C
		-200.0 to 300.0 °C	220 Ω	±0.1% ±1digit	0.1 °C
		-200.0 to 649.0 °C	400 Ω		0.1 °C
	Pt50	-200.0 to 649.0 °C	220 Ω	±0.1% ±1digit	0.1 °C
	Pt-Co	4.0 to 374.0 K	220 Ω	±0.15% ±1digit	0.1 K

Pt100 : IEC751(1995), JIS C1604-1997
JPt100 : JIS C1604-1981 JIS C1606-1989
Pt50 : JIS C1604-1981

○ Exception of accuracy rating

Input range	Measuring range	Accuracy rating
K, E, J, T, L	-200 to 0 °C	±0.2%±1digit
R, S	0 to 400 °C	±0.2%±1digit
B	0 to 400 °C	Not specified
	400 to 800 °C	±0.15%±1digit
N, U	-200 to 0 °C	±0.3%±1digit
W-WRe26	0 to 100 °C	±4%±1digit
	100 to 400 °C	±0.5%±1digit
PtRh40-PtRh20	0 to 300 °C	±1.5%±1digit
	300 to 800 °C	±0.8%±1digit
CR-AuFe	0 to 20 °C	±0.5%±1digit
	20 to 50 °C	±0.3%±1digit
Pt100	700 to 850 K	±0.15%±1digit
Pt-Co	4 to 50 K	±0.3%±1digit

K, E, J, T, R. S. B, N: IEC584, JIS C1602-1995
U (Cu-CuNi), L (Fe-CuNi): DIN43710
W-Wre26, Wre5-Wre26, PtRh40-PtRh20, NiMo-Ni,
CR-AuFe, Platinel II: ASTM

*The indication equivalent to 1mV may vary under the test environment by EMC directives.
*Only the CE corresponding model applies.

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